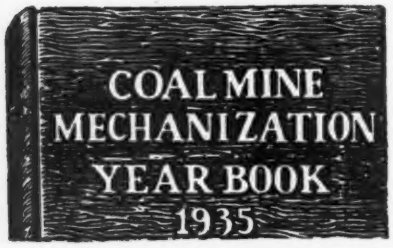
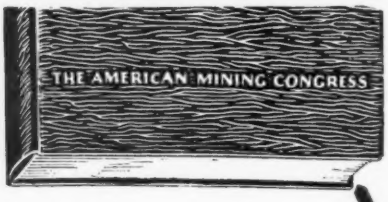
The MINING CONGRESS JOURNAL

"Out Where the West Begins"

ANNUAL METALS NUMBER



"PROFIT BY THE EXPERIENCE OF OTHERS"



BEFORE you plan further modernization of your property study this book carefully. It is a most important aid to efficiency and economy in the application of machine methods to coal mining. The most successful means devised for meeting all conditions are presented to you in a careful and unbiased manner.

Here are a few of the interesting general subjects included: A cross-section of coal mine methods and equipment; a survey of general type of machines used; classification of machines and methods by different seam conditions; statistics showing tonnage with mechanized loading; statistics showing development of mechanical cleaning. In addition, it will also contain the 1935 Cincinnati Coal Convention papers, an exclusive copyrighted feature, together with a description of exhibits, profusely illustrated.

THE AMERICAN MINING CONGRESS
309 Munsey Bldg., Washington, D. C.

Please send me.....copies of your 1935 Year Book as checked below. I shall remit upon receipt of same.

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A Mining Service that has Become a World Standard

Allis-Chalmers has unquestionably been one of the outstanding contributors to modern mining practices and its equipment has gained world wide recognition for its dependability of operation. With a background of experience extending through more than three-quarters of a century in the design and development of mining equipment, Allis-Chalmers cooperation today offers you many advantages such as, in bettering methods, improving operations, and in establishing new low production costs.

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Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A.

The MINING CONGRESS JOURNAL

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Tomorrow's Wire Rope
...what will it be?

TO MAKE CERTAIN that Roebling Wire Rope will give the user the highest obtainable degree of safe, economical service, Roebling has enlisted the aid of the finest and most complete research, testing and manufacturing facilities. The Roebling fatigue testing machine shown is an example. John A. Roebling's Sons Company, Trenton, N.J. Branches in Principal Cities.

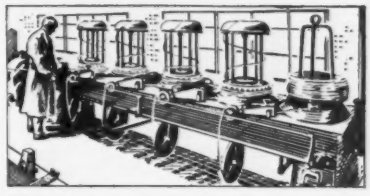
"Some people tell me the world is completed. But I say that behind the scenes, in research laboratories now humming with activity, the world is just in the making."

(From address of a famous industrial executive)

And so in the Roebling Laboratory, one of the country's most modern and completely equipped industrial research units, goes on the ceaseless work of improving Roebling Wire Rope... of developing the wire rope of the future.

The 40,000 lbs. capacity "dynamic" fatigue testing machine shown to the left is one of the relatively unknown and costly pieces of equipment in this laboratory. The mechanism at the extreme left of the picture is an automatic regulator and recorder... the only machine of its kind in existence for making fatigue tests of long sections of wire rope.

A WIRE DRAWING MILL ...IN A LABORATORY!



An experimental wire mill... right in the Roebling Laboratory. A duplicate, on a small scale, of Roebling's main wire drawing plant. The continuous 5-head wire drawing machine shown is part of the equipment in this experimental wire mill.

ONE OF AMERICA'S FINEST INDUSTRIAL RESEARCH UNITS

An exterior view of the 3-story building devoted entirely to Roebling Research.

ROEBLING ...THE PACEMAKER IN WIRE ROPE DEVELOPMENT

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That is all YOU need to do, the next time you buy galvanized sheets, to insure getting that heavy zinc coating, 2 ounces per square foot, which means long extra years of rust-free service. It reduces "per year" costs by 50 per cent or more.

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BETHLEHEM STEELS
to take the brunt around mine and mill

ABRASIVE-RESISTING STEEL PLATES SAVE MUCH PLATE RENEWAL

PLATES for chutes, hoppers, skips, dump cars and similar service are subject to heavy abrasive wear.

Bethlehem Abrasive-Resisting Steel Plates sharply reduce the cost of keeping this equipment in repair. Though possessing the requisite hardness and toughness to greatly lengthen life under abrasive conditions, these plates cost but slightly more than ordinary steel. They are sufficiently ductile to permit simple forming operations.

LONG-WEARING CASTINGS FOR BALL-MILL LINERS, CRUSHER-ROLL SHELLS

BETHLEHEM 88-80 is an alloy steel developed for castings that carry the burden of the grinding and pulverizing involved in concentrating ores. Castings of 88-80 have uniformly high wear-resistance all the way across the surface, all the way through. No soft spots to wear into pockets, no edges so hard as to break off. Every pound of metal is good for a high quota of grinding.

BETH-CU-LOY SHEETS

IN locations exposed to the weather or to extremely damp conditions underground, the rust-resisting properties of Beth-Cu-Loy make for long life.

Beth-Cu-Loy Sheets are made of copper-bearing steel. Atmospheric-exposure tests carried out by the American Society for Testing Materials showed this material to have from two to two and one-half times the resistance to atmospheric corrosion of steel without the copper content.

The ability of Beth-Cu-Loy Sheets to fight rust, coupled with their low cost, makes them the economical sheets to use wherever exposure to the weather or to moisture is involved.

STEEL TIES FOR STRONG TRACK

BETHLEHEM Steel Ties are easy to handle and to attach. They automatically grip the rails at the correct gage and hold them there, eliminating gaging. They make strong track, permitting faster and more efficient haulage, with less danger of derailment.

Bethlehem Steel Ties are made for every mine requirement. They range from the No. 2 Tie, weighing 2½ lbs. per ft., to the Keystone No. 6 Tie, weighing 6 lbs. per ft. When needed, still heavier Bethlehem Ties are available.

HOLLOW DRILL STEEL

IN the manufacture of Bethlehem Superior Hollow Drill Steel every precaution is taken to produce a drill steel that is well protected against fatigue.

During processing, billets and bars are carefully inspected as to surface condition, and all billets are ground, insuring freedom from seams and other imperfections which might later serve as starting points for fatigue.

Another reason for the ability of Bethlehem Superior to defy fatigue is the smooth, concentric bore, free of pits and irregularities, which greatly reduces the opportunities for fatigue cracks to start.

MINE TRACK EQUIPMENT

FROGS, Switches, Switch Stands, Guard Rails, Crossings, and other items of track equipment.

GOLD DREDGES

For the recovery of gold from sands and gravels.

Other Bethlehem Products for Mines

Mine Cars, Alloy Steels, Tool Steels, Bethanized Fence, Carbon Steel Bars, Steel Pipe, Mine Spikes, Bolts and Nuts, Structural Shapes, Steel and Charcoal Iron Boiler Tubes, Light Rails.

Bethlehem District Offices are located at Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Kansas City, Milwaukee, New York, Philadelphia, Pittsburgh, San Antonio, St. Louis, St. Paul, Washington, Wilkes-Barre, York. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Salt Lake City, Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

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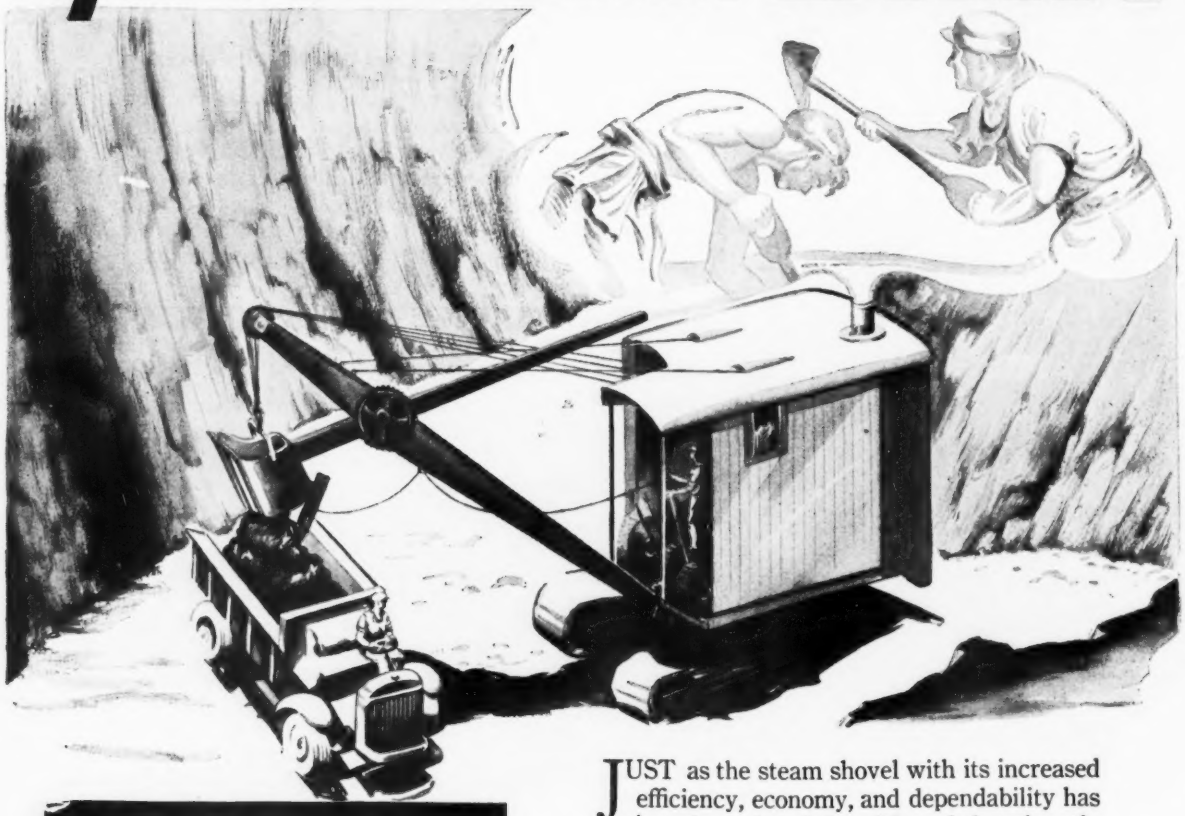
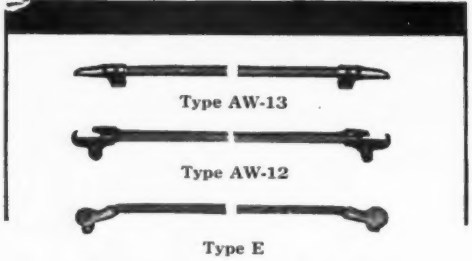
PREFERENCE *based upon* DEPENDABILITY





There is an O-B bond to meet almost every conceivable local condition or personal preference. Ask your O-B representative.

O-B LW welders are available for either 250 or 300 volt service. Their light weight and endurance make them ideal for mine work.

JUST as the steam shovel with its increased efficiency, economy, and dependability has largely replaced the pick and shovel method, so also has the preference grown for modern O-B rail bonds due to their demonstrated dependability and long service life. There was a time, perhaps, when a thousand dollars spent for wasted power would never be missed. Now, however, every penny spent unnecessarily cuts down an already small margin of profit.

Faced with this situation, more and more mine operators are finding that there is a decided dollars-and-cents advantage in using O-B rail bonds. Their proven ease of application, low resistance, and long life are a material aid to lower costs per ton and greater net profits. Try just a few of them the next time you are in need of bonds. You will understand quickly why there is a growing preference for bonds trademarked with an O-B.

1766M

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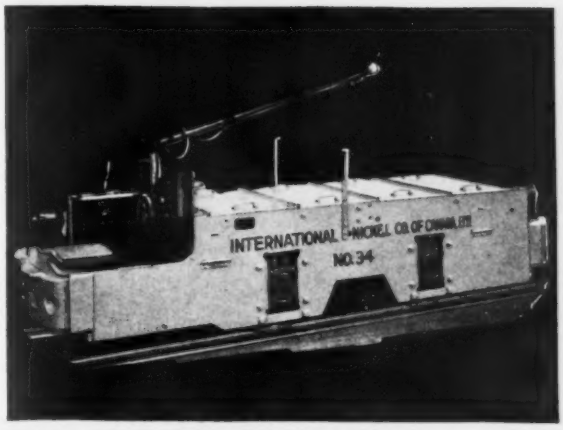
Dependable . . .

EVERY Goodman Locomotive is built to fulfill two definite requirements — suitability for the particular duties to which it is to be assigned; endurance and satisfactory performance.

Features specifically suited to metal mining service are incorporated in their design. They are built to meet narrow gauge conditions and limited clearances. All working units are amply protected from water, dust or muck. Storage Battery, Trolley or Combination Locomotives are available and they range from the lightest tramming to heaviest haulage types.

The qualities and characteristics in Goodman Locomotive design, which have been developed during our many years of experience in manufacturing underground equipment, are your assurance of dependability.



TWO POPULAR METAL MINING TYPES

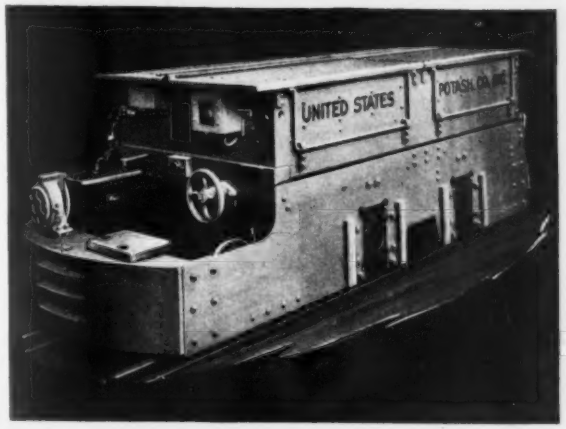
Significant Features of the Type 75 Locomotive

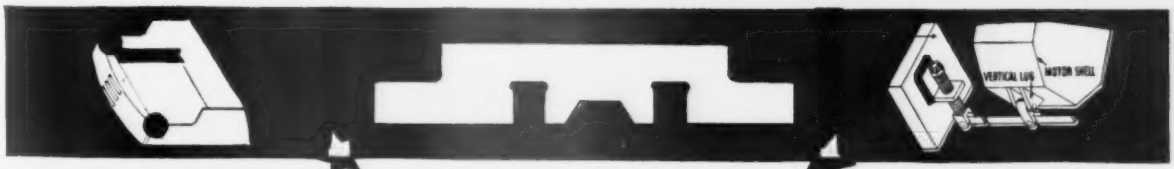
The frame construction, consisting of rolled steel side plates, rigid steel end frames and heavy floor plates, assures permanence of correct alignment for all working parts, minimizing the wear on axle boxes and tires and the liability of derailment. Rigidity is supplied by strong corner construction, as illustrated below. Battery type Locomotives can be lubricated from outside of frame.

The motors have a high continuous rating to protect against breakdown. Large slow-speed armatures drive the axles thru single reduction gearing. Each motor is encased in a solid shell cast integral with one half of heavy axle gear case (water, dust and oil tight) to prevent mechanical injury. The armature shaft is removable. The controls are of a type to conserve battery energy.

Goodman Transverse Equalizers reduce strains resulting from irregular track, permit fewer derailments and equalize weight on all four wheels, insuring maximum drawbar pull.

Ask for Circular H-320-B.





★ Side plate and end frame have accurate shoulder fit, which, together with gusseting effect of floor plate, assures rigidity. ★

★ Cut-outs in frame afford access to brake adjustments and facilitate rerailing. ★

★ Vertical motor lugs with double clevis construction, provide flexibility of universal joint to motor supports. ★

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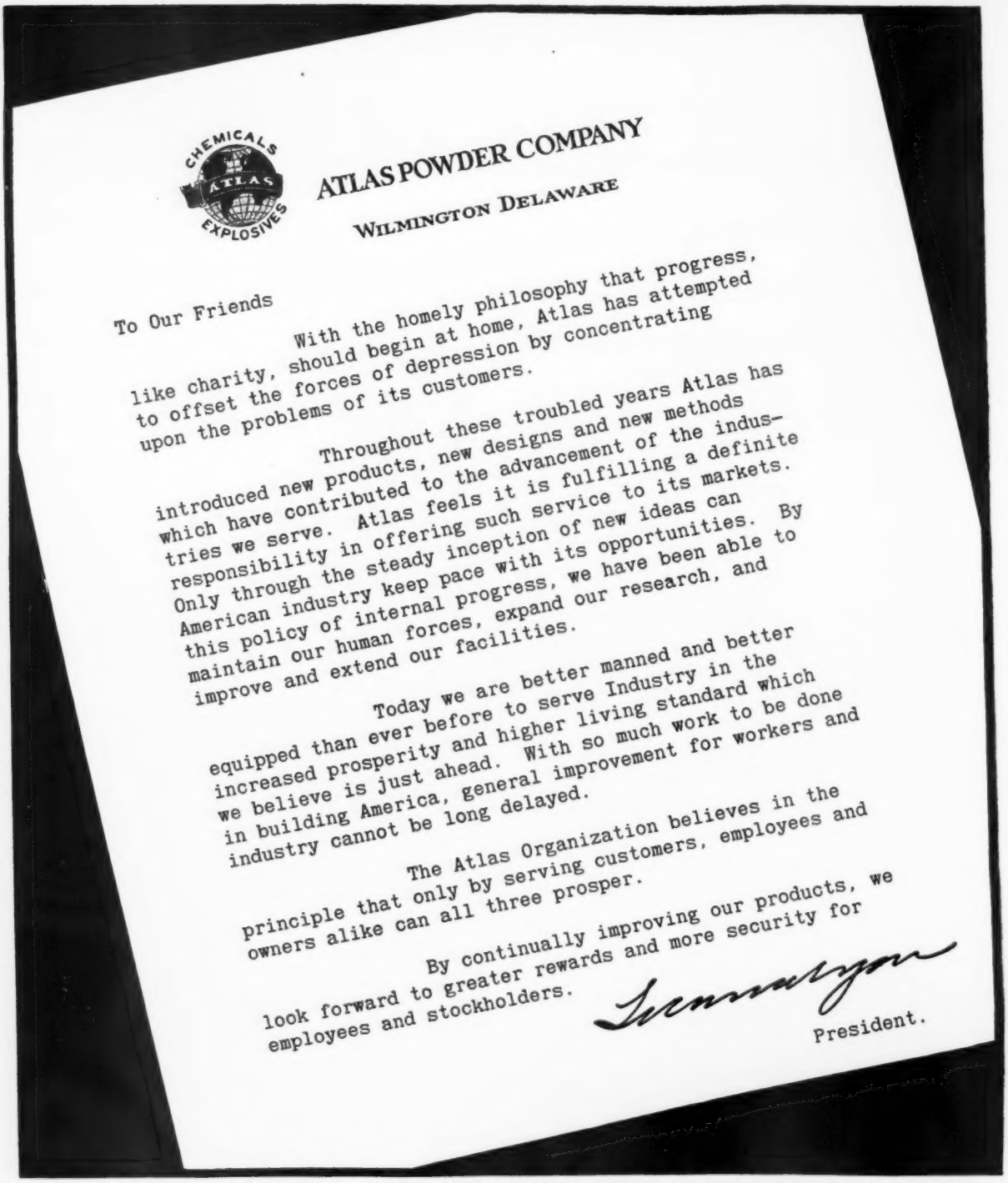

ATLAS POWDER COMPANY

WILMINGTON DELAWARE

To Our Friends

With the homely philosophy that progress, like charity, should begin at home, Atlas has attempted to offset the forces of depression by concentrating upon the problems of its customers.

Throughout these troubled years Atlas has introduced new products, new designs and new methods which have contributed to the advancement of the industries we serve. Atlas feels it is fulfilling a definite responsibility in offering such service to its markets. Only through the steady inception of new ideas can American industry keep pace with its opportunities. By this policy of internal progress, we have been able to maintain our human forces, expand our research, and improve and extend our facilities.

Today we are better manned and better equipped than ever before to serve Industry in the increased prosperity and higher living standard which we believe is just ahead. With so much work to be done in building America, general improvement for workers and industry cannot be long delayed.

The Atlas Organization believes in the principle that only by serving customers, employees and owners alike can all three prosper.

By continually improving our products, we look forward to greater rewards and more security for employees and stockholders.

President.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Products

High Explosives	Zapon Lacquers,	Activated	Chemicals
Blasting Powder	Enamels, Thinners,	Carbons,	Mannitol
Blakstix, Apex	Zapon Leather Cloth	Darco and	Sorbitol
Blasting Supplies	and Coated Sheets	Hydrodarco	Acids

"Big shot Molly"

THE BIGGEST UNDERGROUND BLAST IN THE HISTORY OF MINING WAS MADE AT CLIMAX, COLORADO

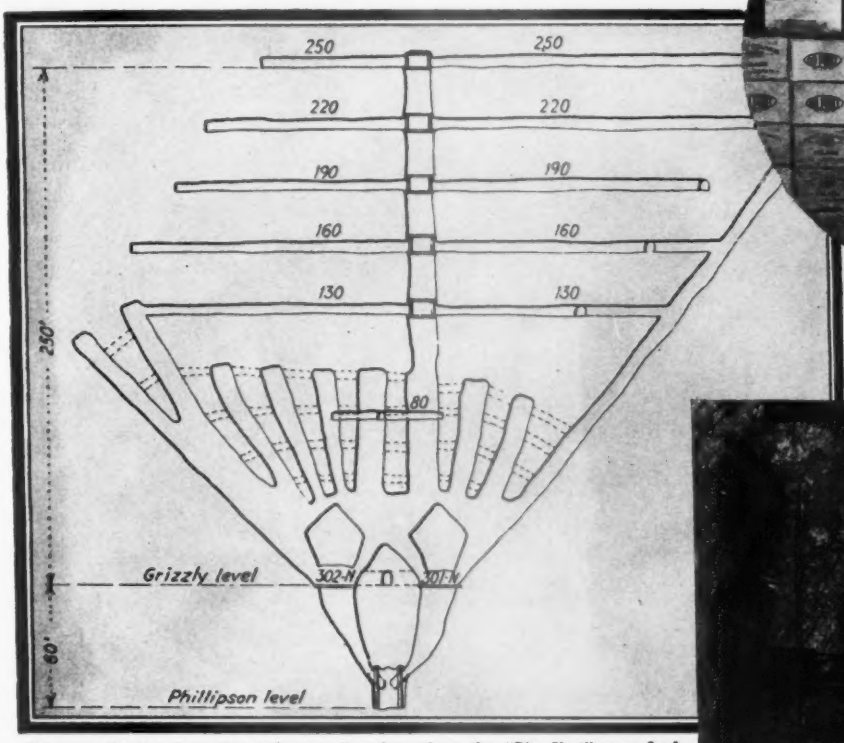

Diagram showing how the underground region where the "Big Shot" was fired would look if part of the mountain were sliced away. Beginning in the undercut pillars below the "80" level, and extending upwards to the "250" level, successive delay charges were fired, breaking the ore for removal through chutes at the bottom.

Loading a supply of 50-pound boxes of du Pont explosives into the buckets of an aerial tramway.

Drilling in the Climax Molybdenum Company's mine at Climax, Colorado. Du Pont Gelex is the explosive used.

FORTY-SEVEN miles of bore holes through solid granite . . . 46 miles of wire . . . 6,350 electric blasting caps . . . 110,500 pounds of du Pont dynamite . . . "All set?" . . . "Everything's O. K., Chief!" . . . "FIRE!" . . . a switch is thrown . . . 350,000 tons of "Molly" ore blocked-out in one "Big Shot" . . . so smoothly done that a fragile electric light bulb, just 150 feet from the blast, didn't even flicker.

This is just one example of the way in which du Pont has cooperated with miners and engineers ever since the beginning of Colorado's mining industry, and the results of our wide and practical experiences are readily available to you.

To better serve the industry in Colorado, we established a branch office in Denver thirty years ago, and magazines stocked with du Pont explosives made at Louviers, Colorado, have been at all times within easy reach. Our representatives are within call at any time, and are available to help with any problems you may have. For further information, write to nearest office.

E. I. DU PONT DE NEMOURS & COMPANY, *Incorporated*

EXPLOSIVES DEPARTMENT . . . . . WILMINGTON, DELAWARE

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Top-notcher

MY OF COMPENSATION COSTS

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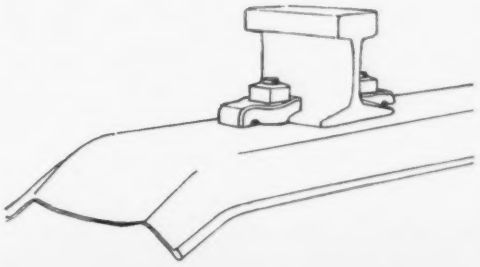
Submarine Escape Apparatus . . . *Descriptive Bulletins will be sent on request*

They're using this METHOD

TO IMPROVE MINE TRACK



Where it is impossible to immediately and completely renovate an entire track system by installing Carnegie Steel Ties, some users are gradually accomplishing this modernization by the spot-in method. As old wood ties need replacing, steel ties are installed. The improvement is noticed at once. Gauge is maintained and the entire track structure is strengthened. Eventually the track is all steel, free from derailments due to spreading or loose rails and requiring a minimum of attention. • Carnegie Steel Mine Ties are made in six standard sections. There's a tie for every purpose. Let us send complete details.

336

CARNEGIE STEEL COMPANY • PITTSBURGH

United States Steel Corporation Subsidiary

We can only guess about the origin of the wheel. Perhaps a rolling log suggested the idea to primitive man, and the first wheels may have been sections of tree-trunk. The underlying principle has never changed. From crude cart-wheels of stone to balloon-tired discs of alloy steel, all progress has come through refinement.

In much the same way, the principle of the mesh or net, on which Exide-Ironclad positive plates are designed, has been known to man for ages. The principle is basic, changeless—it is the use to which it has been put in the Exide-Ironclad Battery, and the constant refinement through the years, that have resulted in a battery of ever-increasing quality and value.

A new material, known as Giant Compound, made jars and covers possible that are practically unbreakable in normal service. Increased sediment space rendered it unnecessary to tear down the battery for cleaning, throughout its life. To support the plates, four ribs instead of two were built into the bottom of cell jars, so that all positive plates are supported separately from the negative plates. Further decreasing the possibility of internal short circuits, two feet were incorporated in the bottom of each plate, raising the plate above its supporting ribs and permitting the separators to come below the bottom of all plates.

Exide Mipor Separators—a recent, revolutionary development—are the long sought permanent storage battery plate insulators. Exide Mipor is immune to electrolyte, heat and vibration.

Exide
IRONCLAD
SILVER ANNIVERSARY
1910 - 1935

BUILT ON A PRINCIPLE AS BASIC AS THE WHEEL

yet different from all other batteries

The Exide-Ironclad completes a quarter century of service

JUST twenty-five years ago (September 9, 1910) The Electric Storage Battery Company, after more than two decades of development and experience, announced a new type of storage battery, designated the Exide-Ironclad. Built on the principle of the mesh that holds solids while permitting liquids to pass freely—a principle that ranks with the wheel in antiquity and importance—the Exide-Ironclad marked an entirely new era in storage battery development.

In the unique design of its positive plates, slotted rubber tubes retain the active material, while exposing it freely to the electrolyte — a type of construction which a quarter century of service has proved to be of exceptional merit.

For the first time in storage battery history, there was made available a battery that combined all four of the essential battery characteristics: high power ability, high electrical efficiency, extreme ruggedness, and long life.

Starting from scratch, the Exide-Ironclad had its way to make in the industry. Accepted by users at first entirely on their faith in its makers, year by year in actual service the Exide-Ironclad proved the merits of its construction and its many advantages, until today it holds a pre-eminent position of leadership in the industry.

Users of Exide-Ironclads are numbered in the thousands. The majority of the submarine boats in the United States Navy, and many in foreign navies, are propelled, when submerged, by Exide-Ironclad Batteries. Deep underground, thousands of Exide-Ironclads propel the storage battery locomotives used for gathering and main line haulage in coal and metal mines. Through mountains and under extinct volcanic craters in California, large fleets of Exide-Ironclads are helping in the construction of the greatest engineering projects now under way in the world.

In factories, mills and industrial plants of all kinds, Exide-Ironclads are lessening the burden of mankind by furnishing the power to propel many thousands of electric industrial trucks and tractors. In addition, they operate electric street trucks, and industrial and railway switching locomotives. Exide-Ironclads help to make comfortable and safe the journey of travelers, being used most extensively for railway air-conditioning, car-lighting, Diesel engine starting, and for radio and marine service by our great railway and steamship lines.

In 1910, the Exide-Ironclad was a battery such as engineers dreamed of. In 1935, it is a battery of dependability proved by a quarter century of actual service.

Here are the features that, for 25 years, have built an overwhelming preference for Exide-Ironclad Batteries among battery locomotive users:

1. **High Power Ability — providing great reserve power for exceptional loads and grades.**
2. **High Maintained Voltage—assuring productive locomotive speeds throughout the entire day.**
3. **High Electrical Efficiency — Exide-Ironclads are economical at the charging panel.**
4. **Extremely Rugged Construction—maintenance costs stay at a minimum.**
5. **Exceptionally Long Life—the economy of Exide-Ironclads is spread over a long period of faithful service.**

These, in constantly greater measure, are what you can expect of the Exide-Ironclad Battery today—and in the future.

Showing clearly how the slotted rubber tubes of the Exide-Ironclad positive plate retain the active material, and hold it in contact with the metallic conducting core which is a part of the grid of the plate. Although the electrolyte can easily penetrate the tiny slits in the tube, the active material cannot readily escape.

★

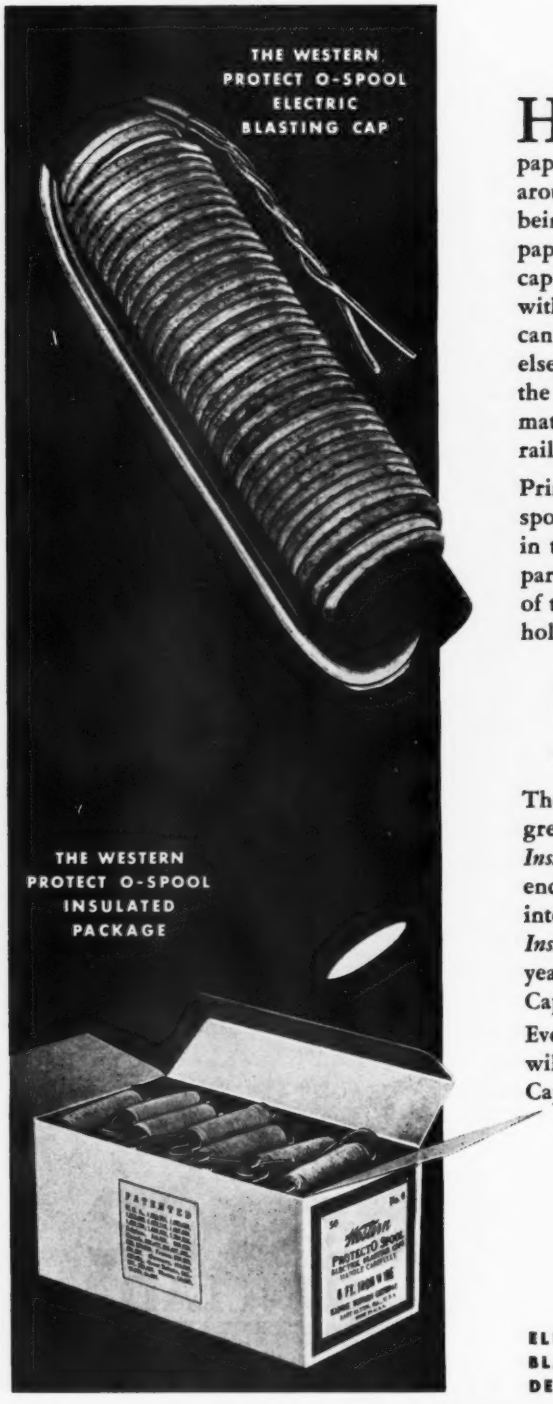
THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Exide
IRONCLAD
BATTERIES
WITH EXIDE MIPOR SEPARATORS

"MIPOR," Reg. U. S. Pat. Off.

Why Face Blasting Danger and Delay?

—*you can have* CONVENIENCE *and* SAFETY



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020-104

GENERAL ELECTRIC

Coal Stabilization

THE original plan upon which the late NRA was based anticipated voluntary cooperation between government and industry. The substitution of coercion for voluntary action seems to have been the cause of its colossal failure.

The failure to appreciate and understand this fundamental weakness has made possible the enactment of the Coal Stabilization Bill hailed as a new NRA for the bituminous coal industry. Few of the bituminous coal operators expect continuous success under this legislation. A considerable number anticipate that for a short time the industry will be stabilized at a price level which will insure an operating profit. Sooner or later all will recognize that permanent success, in a free country, cannot rest upon a curtailment of that individual liberty which is guaranteed by the Constitution of the United States.

The death of the codes was supposed to bring chaos in industry but no such result has happened. Business had prospered for a century upon a competitive basis without the use of government coercion. It was demonstrating its ability to do so again but certain interests demanded a coercive policy and, being politically powerful, forced the enactment of the Guffey bill. It is based upon the theory that all operators will voluntarily cooperate with the Government in so stabilizing the bituminous coal industry as to destroy destructive competition and thus insure profits to all. Competition, the protector of the consumer and the father of progress, is to be stifled.

Nothing short of a great emergency can possibly justify this destruction of competition which has ever been the life blood of commerce and the incentive to labor saving invention. Competition must be preserved to insure further progress.

When business becomes static the incentive for improvement will end. Our railroads faced ruin by bus and air competition. Would anyone desire that the so-called menace to railroad prosperity—good roads, improved water carriers and better air services—be removed? This competition is developing better railroad service. It is making new business and within a few years will largely increase the business of the country. Railroads under the new competition will be forced to so equip themselves as to command their share of the transportation business of the country. And what is that share: That part which under a radical competitive system they may do more economically than their competitors.

The Coal Stabilization Bill is a dam in the river of business progress resting upon the foundation of labor union support and doubtful constitutional authority. If its principles were sound it should be made to apply to all similar industries. If its principles are not sound it will, like its NRA predecessor bring confusion and chaos, and let us hope that it will also convince our Government that its duty is completed when it furnishes justice and protection to its citizens and that every effort, through the taxing power, to build up a surplus for any other purpose is vicious and dangerous: That it may recognize again that our Government is one of limited delegated powers and that the conduct or control of intrastate business is beyond its authority. That bulwark of our liberty, the Supreme Court of the United States, has frequently ruled that the production of any article wholly within a state is intrastate business, wholly within state control, and entirely outside the control of Federal Government.

Congressional action by the Executive under a "must" order to disregard all doubts as to constitutionality is not only dangerous and disgraceful but subversive of the fundamental principles of democratic government.

The Coal Stabilization Bill is of that sort. Prepared and forced through a subservient Congress by a selfish minority without the aid of which its enforcement is impossible the bill must lead to confusion and further delay that return to prosperity for which all so earnestly hope.

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The
MINING CONGRESS JOURNAL

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VOLUME 21

SEPTEMBER
1935

A Journal for the entire mining industry published by The American Mining Congress

In Defense of Industry

THIS country is the product of far-seeing industrial leaders, for we are essentially an industrial nation. Our "resources" have been and are vast; and that word includes brain power as well as material things. Because we have been successful there are those within and without who wish to tear us down, to level our achievements and to attain a reflected glory by attempting to rebuild what they have destroyed.

For the past several years industry as such has been on the defensive. When no greater offense could be conjured, "bigness" ranked high. Many politicians have attempted to gain personal favor by attacks upon industry. Union labor has attempted to control industry. The national Congress has saddled industry with heavy burdens and unwise proposals. William Green, in his Labor Day Address, urged the citizenry to change the constitution to the point where political agencies have the power to fix wages, sales prices and working hours.

Industry has many weaknesses, and it is subjected to the human element of selfishness. With millions of dollars of invested money, the leaders have been so busy trying to make good on their responsibility, that they have had little time for defensive action. Those who accomplish things have little time for explaining the why and wherefore to those who have little right to know except curiosity.

The mining industry represents many major industries. Coal and Lead: Iron and Copper: Gold and Zinc: Silver . . . all represent tremendous enterprises and have contributed their full share to this America we know—a land of the greatest luxuries for the many; the highest wage scale on earth; education and happiness for a high percentage of a hundred and twenty-five million people. True, we have not attained utopia, but industrial leaders in this country need not apologize. They will continue to make this the greatest nation in spite of the shortsightedness of those who are attempting to remodel it.

Every Day Government

THE mining industry has been closely involved in the many legislative proposals that have marked this session of Congress, which has proposed a wide range of legislation—including government control and regulation of natural resources, drastic and confiscatory taxation and the hugest appropriations in our peace-time history.

All industry including mining has been restive under the prolonged attack. We are prone to believe that industry's troubles increase when Congress is in session. To the extent that there is always the threat of unwise legislation that belief is true. But we overlook the fact that Washington has ceased to be Congress, and Congress Washington. We have developed through the New Deal's program a gigantic machine continuously working for—and against—industry, hindering more frequently than helping. Congress is merely incidental to this great machine, whose vast bureaus, commissions and departments are not comprehended even by Congress. Today, in and out of season, Washington is in many ways the hub of the country.

Adjournment of Congress lessens one industrial worry: there can be no NEW laws passed; but the hundreds of agencies created to keep a watchful eye over all phases of industry are still with us, and industry must deal with them for its existence. It is well to remember that government is a continuing process; day in and day out its agencies are conducting investigations, compiling statistics originating regulations which have the force of law, and transacting the business of a giant nation. Knowledge of these agencies is imperative, for industry's problems with government do not begin and end with Congress.

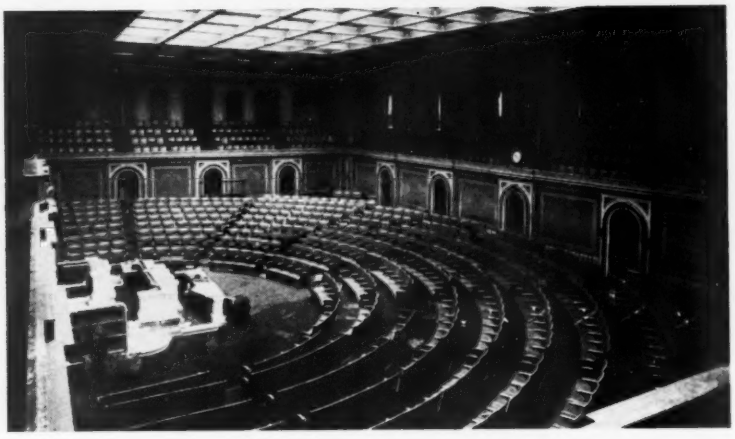
Unwise Criticism

SINCE the decision of the Supreme Court in the Schechter case, considerable criticism has been voiced. Recommendations have been, and still are being made for a constitutional amendment to limit the authority of the Court and make Congress final in its action. Such action would nullify the Constitution and would destroy our present form of government.

But disregarding that fact and proceeding on the premise that at this time we may be blessed with an extraordinarily wise group of Congressmen and Senators, is that any assurance that such a situation may obtain five years hence, or even next year?

When the Constitution was written our forefathers recognized this fact, and provided that the Government should be composed of three great branches, no one of them empowered to perform the functions of the other. We have gone far enough along the road looking to a surrender of authority by any one of these three branches. In order to insure our future, there must be no letting down of this principle: "Free government is possible only when there is a fundamental, sharp, and constantly maintained distinction between the legislative, executive, and judicial functions."

Criticism of this sound principle leads directly to anarchy. We should never lose sight of the possibility of such a calamity as that some day the Executive would be free from restraint; the Congress could enact any law desired; or the courts make any interpretation of the laws that suited them. The Constitution has withstood the strain of a century and more, and our greatest safeguard at this time is that it cannot be amended without the consent of three-fourths of the 48 states.



Wheels of Government

ADJOURNMENT, at midnight, August 26, brought the long hoped-for end to the first session of the Seventy-fourth Congress, after 235 days of a grind which had become distasteful to everyone concerned. In the House of Representatives over ten thousand bills and resolutions had been introduced and in the Senate approximately thirty-five hundred. At the present time over four hundred public acts have been approved by the President. Of these, fifty-seven were major acts covering a variety of pivotal activities including higher tax regulation of public utilities, "Social Security," "Labor Relations Control," "Industry Control," and "Bituminous Coal Industry Control." The Seventy-third Session of Congress has been generally referred to as an "Emergency Congress," whereas the Seventy-fourth Congress has been labeled by many as a "Reform Congress," because of the far-reaching and radical social changes which its activities will bring about if they receive the sanction of the courts. The administration-sponsored bills which finally failed of passage were as follows:

(1) The Walsh Government Contracts Bill, which would have compelled Government contractors to comply with certain provisions of the former NRA codes.

(2) The Ship Subsidy Bill, which would have substituted direct subsidies to shipping interests for the present Mail Contracts.

(3) The Commodities Exchange Regulation Bill—a companion measure to the Securities Exchange Commission Bill of the Seventy-third Session. The Department of Agriculture was very desirous that this measure be enacted.

(4) The Protocols for Adherence to the World Court. Attacks in the Senate blocked this legislation.

(5) The Third Deficiency Bill, carrying a total appropriation of $93,000,000, included items for the National Labor Relations Board, the Social Security Board, the National Bituminous Coal Board, and the National Bituminous Coal Labor Board, as well as for other "New Deal" agencies and instrumentalities. The southern cotton and the western wheat Senators amended this bill to include Government commodity loans and the "prolonged discussion" by Senator Long (Dem., La.), killed the bill.

(6) The Copeland Food and Drug Bill, which had received only moderate approval by the administration.

In addition to the Works Relief appropriation of $4,880,000,000 the appropriations thus far by the Seventy-fourth Congress amount to approximately $8,200,000,000 which, together with permanent annual appropriations, debt retirement, and interest on the public debt for which specific legislation is not required, bring the total appropriations to the sum of $10,433,000,000.

Revenue Act of 1935.—This act as finally sent to the President for approval contains a corporation income tax varying from 12½ percent on net income of under $2,000 to 15 percent on net income of over $40,000. The capital stock tax rate is set at $1.40 per $1,000 of valuation with the right to a redeclaration of value for the protection of the taxpayer under the excess profits tax. The intercorporate dividend tax provides that 10 percent of such dividends shall be taxable under the corporation rates provided in the law, hence a corporation in making its return must include in income 10 percent of all intercorporate dividends received. This is a step toward the policy advocated by the administration, and carries out the intent of the original bill introduced early in the session by Senator Wheeler (Dem., Mont.), intended to break up holding companies. Another section of pointed interest in the Revenue Bill is the "new Section 110" which provides for tax free liquidations of subsiduary corporations. This matter was brought to the attention of the Committee on Finance by the presentation of The American Mining Congress and is materially important to many mining companies as well as to numerous other types of enterprises.

Economic Security Act.—The board of three for the administration of this act has been selected by the President, and former Republican Governor John G. Winant, of New Hampshire, is chairman, for a six-year term; Arthur J. Altmeyer, of Wisconsin, who has been Assistant Secretary of Labor, for a four-year term; and Vincent Morgan Miles, lawyer and Democrat, of Arkansas, for a two-year term. Chairman Winant served on the Cotton Textile Board and as United States representative and assistant director of the National Labor Office at Geneva. He is one of New Hampshire's wealthiest men. Operation of the Economic Security Administration may be held up for lack of funds because of the failure to pass the Third Deficiency Bill. The agency is expected eventually to have a staff of 10,000 employes in its administration of old-age pensions and annuities, unemployment insurance pensions, aid to the blind, crippled, widows, and orphans.

Bituminous Coal Conservation Act of 1935 (Guffey Bill).—With the inclusion of the Borah amendment which denies the act the contemplated exemption from the anti-trust laws, the bill as sent to the President and approved is in much the same form as it passed the Senate. The word "national" preceding the word "organization" in the section providing for the selection of the employes' member of each district board has been stricken out. This permits of unions or organizations of employes other than

those of the United Mine Workers of America, in the conduct of negotiations. The two boards for the administration of this act have not as yet been selected and the actual selection and set-up of administration may be delayed for some time for lack of funds.

Federal Petroleum Act of 1935.—The amendment introduced by Senator Connally (Dem., Tex.), to the Thomas Bill was enacted and provides for the consent of Congress to the interstate compact executed in Dallas, Tex., February 16, 1935. The act makes the Connally "Hot Oil" Bill, passed February 22, 1935, permanent; provides for limitation of imports by the President based on the ratio to domestic production which prevailed in the last six months of 1932, subject to investigation and hearing before the United States Tariff Commission. An amendment by Senator O'Mahoney (Dem., Wyo.), reads as follows: "and such consent is likewise hereby given to the adherence to said compact by any oil-producing state which may hereafter become a party to the said compact as provided in Article VIII thereof."

Public Utility Act of 1935 (Wheeler-Rayburn Bill).—Known as the "Public Utility" or "Holding Company" bill. This bill was finally reported by the conferees and the report accepted by the House and the Senate. It was finally enacted in the form substantially as desired by the administration. As the result of a compromise in conference committee, it fails to set a date for the forced dissolution of holding companies, but leaves to the discretion of the Securities and Exchange Commission such action after January 1, 1938, as is deemed desirable by the commission to force dissolution. The definitions remain substantially as originally written in the bill, exempting from registration companies which produce or distribute electric power incidental to other enterprises. The powers of the Securities Exchange Commission under the law are so broad that the determination of which companies must register lies largely within the commission's discretion. An appointment to the Securities Exchange Commission has been made to fill the place of Ferdinand Pecora. J. D. Ross, of Seattle, Wash., is the new appointee. He is an utilities expert and an advocate of municipal power ownership and governmental power development.

Federal Alcohol Control Administration.—This bill as finally enacted places the administration under the Treasury Department and prohibits bulk sales of liquors. This is of interest to mining particularly in the case of glass sand producers and because of the volume of glass container production which follows the elimination of bulk sales.

National Labor Relations Act.—While the administration of this act may be delayed by the failure of the Congress to provide money through the Third Deficiency Bill, the President has appointed the board of three: Joseph Warren Madden, chairman, a Pittsburgh attorney and professor of law, to serve for a five-year term; John Michael Carmody, industrial engineer, of New York and member of the National Mediation Board (Railroad Board), three-year term; Edwin S. Smith, labor relations specialist, of Massachusetts and member of the former National Labor Relations Board, term of one year.

Prohibiting Discrimination in Price Between Purchasers (Patman Bill).—As in the case of the Walsh Government Contracts Bill, which died by a vote of 13 to 7 in the House Committee on the Judiciary, the Patman Bill remains without action. Intended to curtail the activities of large chain store organizations in the field of food distribution it was worded so as to be all encompassing and would have affected the natural resource industries.

The close of the first session of the Seventy-fourth Congress is only the beginning of the activity which will be entailed in the development of the regulations under which the laws enacted will be administered. As is well known, legislative procedure is very frequently incomplete and the definite intent and detailed administration of the laws is left to the departmental and other independent Government agencies charged with the duty of administration. It is necessary and desirable and, furthermore, it is desired by these departments and agencies that the representatives of industry affected by these laws and by their administration cooperate in the development of the regulations and in the set-up and organization of the agencies which are to carry out the organization and administration. The four months which are to elapse before the convening of the second session of the Seventy-fourth Congress will see this work only partially accomplished. The regulations covering the Revenue Act, the Economic Security Act, the National Labor Relations Act, the Bituminous Coal Conservation Act of 1935, and others cannot be completed by January, 1936, nor can the administrative organizations be set up by that time. In the necessary detail which must eventuate, there is, of course, the further question of court action to follow the origination of litigation which seems inevitable in the case of some of these acts. A natural part of the activity of the second session of the Seventy-fourth Congress convening in January, 1936, will consist of patch and repair work to make these laws workable and to provide further money to carry pay rolls and expenses attendant thereupon.

CUPELLATION OF ASSAYS, ESPECIALLY SILVER

Cupellation is a process of separating gold and/or silver from lead and other impurities in a cupel made of bone-ash or other absorbent material heated in a muffle furnace. In assaying, the lead and other impurities are oxidized and sink into the cupel, leaving as a single bead on its surface the unoxidizable gold and/or silver. Factors in good cupellation are quality of cupel material, well-made cupels, temperature control, air supply, and the gold-silver-lead alloy. All textbooks on assaying discuss cupellation and a number of articles have been published thereon. In assaying silver ores, or gold ores in which the silver content is high, there is more or less loss in cupellation. During a period of years, the reason for this has been investigated by J. T. King, associate professor of mining engineering in the University of Toronto, Ontario, Canada, and his findings are available in Bulletin 147 (1934), of that institution. The 69-page publication (free) contains much information of use in daily practice, and the main conclusions are as follows:

1. Volatilization silver losses were found to be less than 0.5 percent of the total silver loss in the cases investigated, or 0.0076 percent of the total silver present.

2. Composite cupels of 70: 30 cement: bone-ash mix by weight gave as low a loss as those of all bone-ash, and at a cost of one-third. Moisture in making cupels should not exceed 10 percent; 6 to 8 percent is satisfactory at a pressure of 800 pounds/square inch at the die.

3. High-pressure cupels gave lower losses than those of lower pressure, but would not operate at as low a muffle temperature. Time of cupellation did not increase with density. Pressures of 800 to 1,600 pounds at the die, with 10 to 12 percent moisture, are recommended for bone-ash. Whatever combination is used, it should be kept constant from cupel to cupel.

4. For uniform losses, cupels should be of equal height. The loss increase with decrease in height.

5. Cupels made with a gradation in sizes of bone-ash particles are superior to those where any one size predominates; a mix that gives a maximum density is indicated as desirable.

6. Seasoning or aging of bone-ash cupels is unnecessary, provided that care is exercised in drying to avoid cracks.

7. With reasonable finishing temperatures, beads may be left in the muffle after finishing, without appreciable loss.

8. Within the range of depth ordinarily used, increasing the cupel cup depth, while retaining the same general shape, decreases the loss but increases the cupellation period.

9. Shape of cup is an important factor affecting loss and time. A cup whose shape raises the cupelling lead into the air stream increases loss and decreases time; a cup whose shape lowers the cupelling lead from the air stream decreases loss and increases time.

10. Two cupels of 1¼ inch diameter and 1 inch high, with cups 5/16 inch deep, and giving practically similar results, were developed. They gave much lower losses than a standard cupped cupel. Their cups were synclinal, the center being somewhat deeper than if the curve had been continued normally.

11. In comparative assays, and as a basis of purchase and sale of metal, a standard cupel should be adopted by all concerned. — *Abstracted by M. W. von Bernewitz.*

Of all things . . .

THE Seventy-fourth Congress was a piker in comparison with its predecessor in appropriating money. . . . Of course, it still has another session within which to catch up. . . . The Seventy-fourth in the past eight months has ladeled out about ten billion dollars—$10,433,042,812, if you want to be finicky about figures. . . . Which is still a billion short of what the Seventy-third Congress did when it came to shoveling out funds. . . .

■ ■ ■

The ten billion total included two billion for public debt retirement and interest and other fixed appropriations for which specific acts are not required. . . . Heading the list was, of course, the $4,880,000,000 for works relief. . . . Next was the relatively picayunish nine hundred three million dollars for the Treasury and Post Office Departments. . . . And then came war preparation with eight hundred fifty million dollars for the army and navy. . . . Strange as it may seem, the stepchild was the legislators' own legislative department with a tiny twenty million dollars—a reduction from last year. . . .

■ ■ ■

During the eight months the 531 legislators introduced 13,824 bills and resolutions of all kinds. . . . But the Congress' percentage of enactment remained as small as that of most Congresses. . . . About 400 public laws, about 300 private laws, and some 50 resolutions finally resulted from its labors. . . . And while it was a long session—the legislators complained about that—it was far from the longest. . . . The Seventy-fourth's mark of 235 days is the longest since 1922 when the Sixty-seventh sat 292 days. . . . but the record is 354 days by the "War Congress" of 1917-1918. . . .

■ ■ ■

The Nation got worried in the later days of the congressional session over the health of its legislators. . . . So many reports were current (inspired by the Congressmen) that Congressmen were fainting from overwork; that many were in hospitals and others ill at home that there was cause for alarm. . . . Some people even thought that the entire Congress might be wiped out if the session continued much longer. . . .

■ ■ ■

But now it comes out. . . . Out of the 435 Congressmen in the House, just exactly eight were there for every roll call during the session. . . . Six were Democrats and two Republicans. . . . That doesn't mean that even these eight were present every day of the 235 days of the session. . . . No indeed. . . . During the eight months the House actually sat 166 days and in that time 204 roll calls were taken. . . . The honored eight didn't miss a roll call . . . which means they were probably present every day the House sat. . . .

■ ■ ■

The Senate didn't work quite as hard as the House. . . . During the eight months it was here, it was in session just 159 days. . . .

But five minutes after their plan of attack was known, the President was being advised on other sources for the needed seventy-five million dollars for social security. . . . As a matter of fact the Administration could have afforded to jettison the deficiency bill without carrying the session over another week. . . . But the delay afforded an unusual opportunity for a last attempt to secure enactment of the EFHA and its program of cheap electrical appliances for the farmer. . . . The last attempt worked. . . . But that's one big reason why the session went into another week after having already passed the sine die adjournment resolution in both Houses. . . .

■ ■ ■

Biggest thorn in the side of the Administration this session has been Louisiana's Huey Long. . . . His five-and-one-half-hour filibuster on the closing night of the session prevented enactment of a vitally necessary appropriation bill carrying funds for operation of a half dozen vital New Deal enactments. It was Long's second important filibuster of the session. . . . His first was the second longest individually conducted one in the history of the Senate—15½ hours in an effort to stop the NRA extension. . . . He talked himself out. . . . the NRA was passed. . . .

■ ■ ■

Senate leaders are so disgusted that they plan to amend treasured Senate rules which allow a Senator to speak on anything he wants as long as he wants. . . . But there have been bigger and better filibusters than Long's. . . . The elder Robert LaFollette's 18 hours and 27 minutes against the Aldrich currency bill. . . . "Pitchfork" Ben Tillman's recital of Byron's "Childe Harold" for hour on hour to secure a $47,000 appropriation for his South Carolina . . . a group filibuster in 1846 against the Oregon bill which ran two months. . . . These are some of the records. . . . And that's why there is scant hope for amending the Senate rules to curb filibusters. . . . Long's worst enemies won't vote for it. . . . And some of them remember that Senator Tyding's filibuster against the flood control bill sent a $500,000,000 "pork barrel" measure to the scrap heap this session. . . .

■ ■ ■

Virginia's Carter Glass was another thorn—but in another way. . . . He laughed things to death . . . or sent them to oblivion with some of his caustic wit . . . delivered, as always, out of one side of his mouth. . . . He upset the Administration's hopes on the bank bill, modified the grant of powers to the President on the four billion dollar relief, and smashed hope of AAA control of bee husbandry by ridicule of the provision which would have hampered the sex life of the queen bees. . . . His greatest compliment came from an opponent who said: "Think what an insuperable foe he would be if he used his whole mouth to speak with!" . . .

THE METAL MINING
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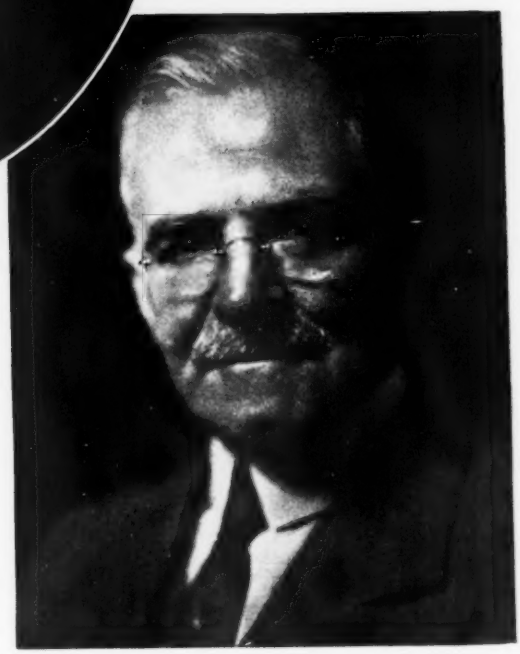
Chicago, Illinois

September 23-27, 1935



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The American Mining Congress

Julian D. Conover, Secretary

Howard I. Young, President

James F. Callbreath, Secretary Emeritus

What the American Mining Congress Means to the Mining Industries

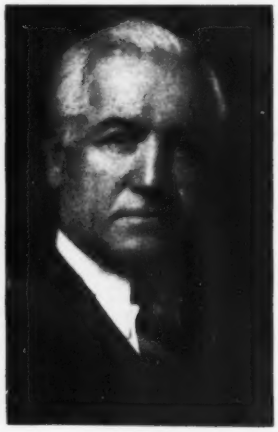
THE "mining industry"—one of our two really basic industries—is in reality a series of industries, each in itself of major importance, employing thousands of men, paying millions in taxes to state and national governments and furnishing raw materials for a large number of industrial enterprises. In times of normal production there are approximately 25,000,000 persons directly or indirectly dependent upon the extraction and processing of mineral products for their livelihood. Approximately 1,700,000 individuals find employment in strictly mining enterprises. Products from the mines furnish approximately 56 percent of the total revenue freight handled by Class I railroads. The mineral industries contribute 22 percent of the Federal income when normal conditions prevail; and it is estimated that the annual taxes paid by producers of minerals in a normal year is more than $200,000,000. To operate these properties efficiently, these industries must spend $350,000,000 annually for equipment and supplies.

No industry, no matter how gigantic, is so self-sufficient that it does not require the cooperation of other industries, and no industry may truly interpret itself without the aid of a common denominator. The mineral industries, representing tremendous enterprises, require a common meeting point for the discussion of the problems of universal application.

It was this need for cohesive effort that led to the organization of the American Mining Congress, and it has been this need that has made this organization the great common denominator of the mineral industries. Its past history and accomplishments are fairly well known to the mining groups. Its work has included an educational forum looking to a proper appreciation of the national importance of minerals; a campaign which has led to conservation of both minerals and human lives. Its work in behalf of safety has been continuous since its original successful effort for the creation of the United States Bureau of Mines. It has been a leader in developing modern methods of mining practice and equipment. It has been a potent factor in advancing reliable data upon which sound legislation could be enacted. It has opposed unjust and discriminatory legislation aimed at the natural resource industries. It stands upon its record of past achievement, which has been made possible through the cooperative leadership of mining men from every branch of the industry and from every section of the country.

What the American Mining Congress means to the mining industry cannot be said in a few words. Its influence is far-reaching, its foundation is solid. The platform for its activities, advanced, approved, and adopted anew each year, is arrived at by the industry itself and is fully representative of those great industries for whom it speaks with such authority. In brief, the American Mining Congress is a great cooperative organization, expressing the will of the industry, assisting in formulating its policies, interpreting the language of mining into creative and helpful service and bringing about a national coordination of interest in a basic industry. It goes even further in that it attempts to coordinate its work with other great industrial units of allied interest. The American Mining Congress has stood the test of time. It is now 38 years old, and each year has seen it more solidly entrenched, rendering greater service and bringing together in closely knit unison those factions that might otherwise be waging battle against, instead of for, each other. The American Mining Congress stands as the bulwark between the mining industry and unfair and unwise proposals inimical to its successful usefulness. It is the open door to cooperative effort and offers limitless opportunity for service. It brings to each branch of the industry the interested and intelligent cooperation of every other branch and, as their common denominator should, it reduces each common problem to its simplest equation, and through its widespread cooperative service achieves where lesser organizations would fail.

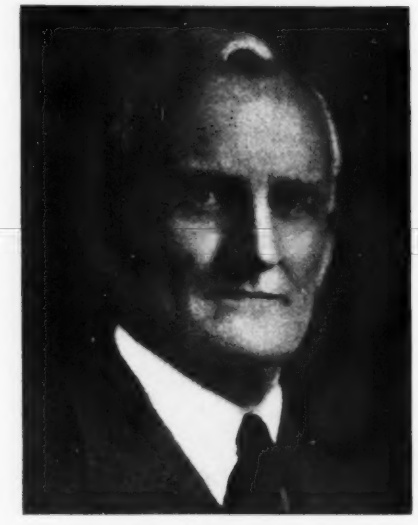
Chas. H. Segerstrom



D. A. Callahan

A. E. Bendelari

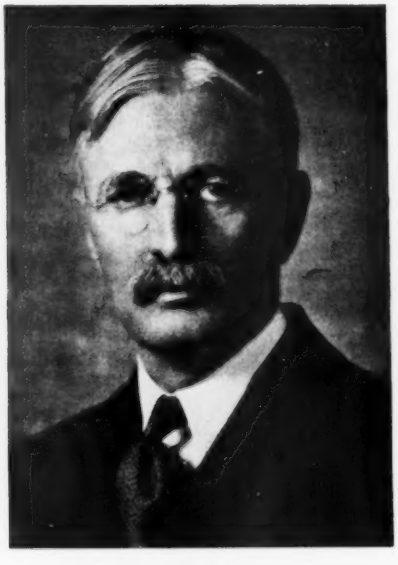
Representatives of the Metal Mining Industry



Donald B. Gillies

on the Board of Directors

D. D. Moffat



Clinton H. Crane

The Outlook for Metals

J. B. Putnam
D. D. Moffat
Donald B. Gillies

THE general outlook for metal mining is, of course, largely dependent upon the general outlook for revival of business, particularly in the capital or heavy goods industries.

With short-time money available in large quantities at very low rates for responsible borrowers, its availability for long-time borrowers who need it most, and for capital constructions, is naturally dependent almost entirely upon confidence as to the future. The necessary confidence might be further classified as:

1. Confidence in political stability.
2. Confidence in financing stability.
3. Confidence in price stability.

Under our present situation, the second is largely dependent upon the first, and the third upon the other two.

While there is a tremendous pressure from an accumulated demand for goods, the indications are that the 1936 political campaign will involve radical issues and a bitter contest, and I doubt if business can really go ahead on a substantial scale until the country is pretty well satisfied as to the outcome.

In the meantime, we probably will continue to have sporadic lifts in business with real recovery, on a rapidly ascending scale, as soon as the country can be assured that next year's elections will be decided on a basis calculated to restore confidence in the political and financial stability of our country.

If such elections should be decided otherwise, we probably are in for another considerable period of readjustment, uncertainty and bad business.

J. B. Putnam

THE metals are so much a part of general industry that a discussion of the outlook for metals implies a discussion of the general business and industrial outlook. Almost every issue of the newspapers has something along this line from some source and I shall not add to them further than to observe that there are evidences of improvement in the non-ferrous base metal situation. The extent of the improvement is as yet so limited that it would scarcely be noticed in normal times, but I think the trend is there nevertheless.

It is apparent that many of the producers throughout the world are endeavoring to approximate current production to current consumption, which tends toward reduction of accumulated stocks of the metals when an unusual market demand comes from time to time. This is an encouraging feature of the situation, as it is obvious that production activities cannot fully assert themselves as long as extraordinary stocks remain unsold.

D. D. Moffat

THE performance of the steel industry during the summer season came as something of a surprise to many observers. It had been generally expected that any seasonal decline which was in store would be less severe than the sharp recession in the summer of 1934, but few predicted that there would be a strongly rising curve of activity during July and August. The lowest point in weekly operations was touched during the week of the fourth of July, at around 33 percent of capacity. There followed an immediate rebound with expanding operations, and the outlook for the Autumn is good.

The explanation of the improvement is to be found in a number of causes, but underlying all other factors is the fact that we have passed through five years of extreme depression during which time production lagged behind consumption. Things in use have been worn out. This applies especially to automobiles, in which market a great replacement demand has arisen. It applies to machine tools and factory equipment, much of which is either worn out or has become obsolete. It also applies to farm tools and equipment and to many other common articles made of steel.

The result of this situation has been the starting in motion of the natural forces of recovery. This was first most apparent in such lines as the automobile industry. It has spread to the machine tool and similar industries. All that is lacking to supply the elements of full-fledged recovery in steel is the coming to life of the heavy industries, such as construction and railroad equipment. In construction there are evidences pointing to the beginning of an upturn. The heavy industries requiring capital investment have been held in check by the lack of investment confidence. The current year has witnessed a substantial volume of capital financing, but it has been largely for refunding and does not represent capital going into new enterprises or new channels. In spite of various disturbing clouds on the political horizon, there have been evidences of at least the beginning of a return of confidence on the part of business and capital, and this is one of the hopeful elements in the possibility that general recovery is under way.

The automobile industry has emerged in recent years as the most important single customer of the steel industry. It is estimated that close to 30 percent of the steel output during the first six months of this year went to the automobile industry. Car assemblies in the United States and Canada during the first seven months of 1935 approximated 2,720,000 units, compared with 2,072,000 units for the corresponding period of last year. Retail demand for motor cars held at an encouraging level even during the summer. This fact, together with the introduction of new models scheduled for autumn, proved a stimulating influence upon steel activities in the summer. It is now thought probable that the full-year output of cars and trucks will be approximately 3,750,000 units, which would represent an increase of 400,000 units over the average of expectations held at the start of the year.

While automobile sales have been widely distributed, perhaps the most important stimulant has come from the agricultural sections. During the depression the purchase of new cars in agricultural sections declined to 5 percent of the total sales. Around 20 percent of all automobiles and 26.6 percent of all trucks are farm owned. With farm income for 1935 estimated at $2,000,000,000 more than in 1934, a fair share of this increase is going into the purchase of new cars and trucks.

The improvement in farm income, which has helped automobile sales in the agricultural sections, is operating in the same direction with respect to farm implements. The production of various farm tools and tractors has shown very little let-down this year and output for 1936 uses is already under way.

One of the most encouraging aspects of the present industrial situation is to be found in the increased purchases of machine tools. There has also been a

moderate improvement in industrial building, and a more marked improvement in residential building, all of which have added to the sum total of miscellaneous demand.

Steel prices have held steady, although many people outside the steel industry had expected that the passing of the Code would bring about the collapse of the price structure. This was because of the wholly erroneous impression which prevailed in numerous quarters that under the Steel Code steel prices were fixed by the American Iron and Steel Institute and competition was eliminated. Under the Steel Code, prices were not fixed, inasmuch as the members of the American Iron and Steel Institute merely posted prices with the Steel Institute.

During the period of the Code, prices advanced moderately, but not so greatly as the average for all commodities. Somewhat higher steel prices were made necessary by the three wage advances under the Steel Code and the shortening of hours which greatly enhanced costs. Wage rates under the Code went up 35 percent. More than 80,000 employes were added to the payrolls of the industry and during 1934 these payrolls increased by $100,000,000. The industry as a whole has continued in the red since 1930, but the improvement during the current year gives evidence of at least a small degree of profit for the industry for the first time in five years.

With the passing of the Code as a result of the Supreme Court decision invalidating the NIRA on May 27, there was much speculation as to what would transpire in the steel industry, particularly with respect to wage and hour provisions. On June 6, representatives of 150 companies of the industry throughout the country met in New York and pledged themselves to maintain rates of pay, maximum hours of labor and standards of fair competition as described in the Steel Code. They also pledged themselves to protect employes' rights in collective bargaining. To my best information, these pledges are being kept with the result that the passing of the Code has resulted in no disadvantage to the industry's 400,000 employes.

The steel industry has been extremely fortunate in its labor relations, in that peaceful and harmonious conditions have continued to prevail. This is largely due to the satisfactory functioning of the employe representation plans in effect generally throughout the industry. An industry-wide survey of recent employe elections shows that more than 90 percent of the employes in the steel industry are actively participating in the employe representation plans which they have adopted and which is their chosen method of collective bargaining. This survey was conducted by the American Iron and Steel Institute, and one year ago a similar survey showed that employe representation plans were supported by 85 percent of the employes.

There are many reasons to believe that the steel industry stands at the threshold of another era of large expansion and activities. New markets are opening up to the industry and new products and processes have been developed to meet the country's growing requirements. The industry is spending over $125,000,000 this year in new equipment and in modernizing plants, and it is prepared to meet the country's needs for steel, whatever they may be.

Donald B. Gillies

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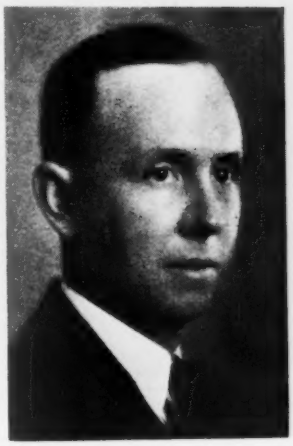

Roy Earling

R. B. Tempest

E. A. HAMILTON

General Manager, U. S. Smelting Refining and Mining Co., Salt Lake City, Utah.

Chairman, Board of Governors, Western Division of The American Mining Congress

WM. B. DALY

Manager of Mines, Anaconda Copper Mining Co., Butte, Mont.

Chairman of the Program Committee

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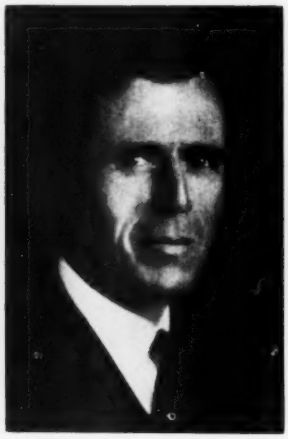
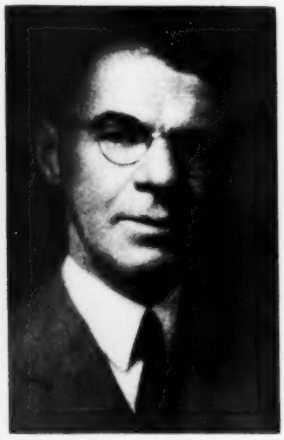
Carl Zapffe



H. E. Treichler



Chas. A. Chase

G. H. Jones

P. G. Beckett

Guy N. Bjorge

E. H. Wells

Val DeCamp

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A. P. Ramstedt

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M. M. Leighton, Chief, State Geological Survey.
A. Warsaw, Pres., Wedron Silica Co.
L. E. Wemple, Pres., Illinois Zinc Co.
Chas. A. Pratt, V. P., Goodman Mfg. Co.
Wilmer H. Cordes, Adv. Mgr., Am. Steel & Wire Co.
Henry S. Beal, Pres., Sullivan Machinery Co.
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Chairman: **H. E. Treichler**, G. Mgr., Texas Gulf Sulphur Co.
Brent N. Rickard, Mgr., El Paso Smelting Works, American Smelting & Refining Co.

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Jas. A. Caselton, 2nd V. P. and Sec., St. Louis Smelting & Refining Co.
Geo. W. Potter, V. P., Eagle-Picher Mng. & Smelting Co.
M. D. Harbaugh, Sec., Tri-State Zinc & Lead Ore Producers Assn.

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Chairman: **W. J. O'Connor**, Mgr., Utah Dept., American Smelting & Refining Co.
D. D. Moffat, V. P., Utah Copper Co.
W. Mont Ferry, V. P., Silver-King Coalition Mines Co.
Jas. W. Wade, V. P., Tintic Standard Mng. Co.
W. H. Eardley, Asst. Mgr., U. S. Smelting Refining & Mng. Co.
J. O. Elton, Mgr., International Smelting Co.
Duncan MacVichie, Cons. Engr., Salt Lake City.
A. G. Mackenzie, Sec., Utah Chapter, A.M.C.

WISCONSIN

(Lead & Zinc) Chairman: **W. N. Smith**, G. M., Vinegar Hill Zinc Co.
E. R. Shorey, Assoc. Professor of Mng. & Met., University of Wisconsin.

Helping *Metal Mining*

Solve its Problems

By WM. B. DALY*

J. F. McCarthy

THE Western Division of the American Mining Congress is its metal section. It was organized in 1923 for the purpose of developing a closer relationship between the various mineral producing states. Its national chairmen have been leaders of outstanding importance in the industry. These include Robert E. Tally, formerly president of the United Verde Copper Co.; Jesse F. McDonald, president, Down Town Mines Co.; Imer Pett; Philip Wiseman, United Eastern Mining Co. Frank M. Smith, Bunker Mill & Sullivan Mining & Concentrating Co.; Brent N. Rickard, American Smelting and Refining Co.; C. F. Dike; W. S. Boyd, Nevada Consolidated Copper Corp.; and E. A. Hamilton, U. S. Smelting Refining & Mining Co. With such leadership and the cooperation of western mining men, it is quite obvious why this section of the American Mining Congress has grown in strength and service. The division includes large units of industry—the copper group with its special problems, the iron group, lead and zinc, gold and silver, and miscellaneous metals, each with their independent problems, have joined hands in meeting the continually multiplying number of mutual and interlocking problems that have beset the industry, particularly during these last years of industrial depression.

Once each year this division stages an annual convention and exposition. The major purpose of this meeting is to develop a platform upon which metal mining men can unite for cooperative action; for the passing of resolutions, advocating to the main organization, the American Mining Congress, the combined judgment of the industry. The program is wide in scope, covering problems of practical operation as well as those of major economic importance. In the 1935 convention and exposition, to be held at the Palmer House, Chicago, Ill., September 23 to 27, we have had the active personal cooperation of 86 individual mining men. These men have given weeks of their time in the development of the program. They have had the cordial cooperation of literally hundreds of men throughout the metal mining fields.

In the beginning, the committee asked the cooperative aid of some 4,000 metal

W. Mont. Ferry

F. C. Van Deinse

A. Y. Peterson

* Chairman, Program Committee, Annual Metal Mining Convention; Mgr. of Mines, Anaconda Copper Mining Co.

F. A. Thomson

M. C. Lake

Alfred Kauffmann

Julian Boyd

Thos. H. O'Brien

Philip H. Argall

S. R. Elliott

J. A. MacKillican

Andrew A. Zangara

Geo. H. Rupp

F. O. Case

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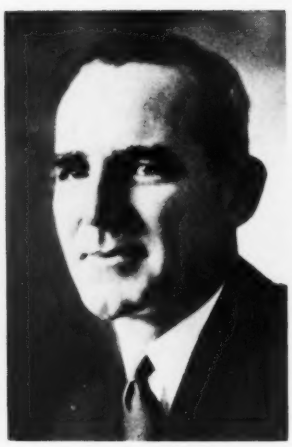
Stanly A. Easton

J. O. Elton

John A. Burgess



Geo. W. Potter

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Brent N. Rickard

W. P. Chinn

G. Chester Brown

Ross D. Leisk

L. D. Gordon

Jas. W. Wade

Robt. W. Thomas

mining operators. A very large percentage responded. Meetings have been held in each state, presided over by the national chairman for that state. These state groups have canvassed their situation from every standpoint and have made recommendations to their chairmen for topics which they believe will be helpful in assisting metal mining in meeting squarely many of the major difficulties confronting it. These conventions offer a most excellent open forum for the discussion of problems of common interest. It is anticipated that, through the resolutions adopted and through the cooperation of metal mining men generally, this year's convention will present to the national organization for ratification a constructive program which may be followed by the Western Division for the coming year. The convention is being held for the first time since 1921 in the central location of the Middle West. Previous meetings have been held at strictly western points, such as Spokane, San Francisco, Los Angeles, Phoenix, Salt Lake City, and Denver. The western board of governors selected Chicago in order that it might have more complete cooperation from producers from the iron ranges, and from the producers of lead, zinc, and copper from the Mississippi Valley and the Northern Peninsula. It is expected that this meeting will bring together for mutual discussion industrial leaders of the East, large delegations of operating men from the western mineral states, the producers of iron ore and representatives from the Tri-State lead and zinc fields, as well as from the smelting centers of St. Louis and Chicago. The opportunity offered for constructive work in behalf of the metal industries was never greater. Railroads have offered special concessions, and everything possible will be done for the comfort and pleasure of the visiting delegates.

The committee presents for your consideration the program on pages 42 and 43.

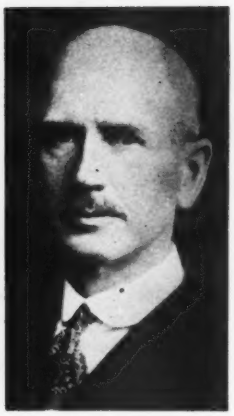
The manufacturers of mining machinery and supplies, who are as definite a part of the mineral industries as are the producers themselves, have joined with the operators in making the 1935 convention and exposition one of real im-

Henry M. Rives

H. J. Saladin

Ira L. Wright

Wm. A. Simkins



Jesse F. McDonald

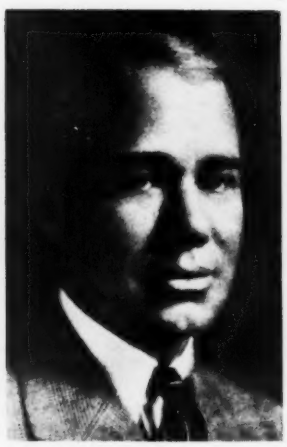
Robt. E. Tally

Jas. A. Caselton

Wilmer H. Cordes

W. H. Eardley

A. C. Callen



Max H. Barber

John G. Clark

portance. Nationally known companies catering to the metal mining field have taken space and will present a wonderful exposition, showing their latest equipment, and their representatives will be on hand to discuss with interested operators their recommendations for production with greater safety, economy, and profit.

The exhibit will occupy about 15,000 square feet of floor space, and will be staged on the same general floor with the convention sessions. Everything will be on display from bearings to steam (miniature) shovels: from powder to concentrating tables. At this date (September 5) approximately 50 companies have contracted for space. These include:

Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
American Sheet & Tin Plate Co.
American Steel and Wire Co.
Atlas Lumnite Cement Co.
Atlas Powder Co.
Carnegie Steel Co.
Crane Company.
Crucible Steel Company of America.
Du Pont de Nemours & Co.
Thomas A. Edison, Inc.
Dorr Co.
Fairbanks, Morse & Co.
General Electric Co.
Goodman Manufacturing Co.
Hercules Powder Co.
Ingersoll-Rand Co.
Jeffrey Manufacturing Co.
Knox Manufacturing Co.
A. Leschen & Sons Rope Co.

(*Concluded on page* 44)

Perry G. Harrison

A. G. Mackenzie

A. K. Bushman

Robert S. Palmer

A. H. Cronk

Rudolph Ericson

PRELIMINAR Y

METAL MINING CONVENTION, WESTERN D IVI

Palmer House, Chicago, Illi nois

Monday, September 23

9.00 A. M. REGISTRATION

10.00 A. M.

CHAIRMAN: E. A. HAMILTON
General Manager, U. S. Smelting Refining & Mining Co.

THE STORY OF ALLOYS
A Motion Picture

NEW USES FOR LEAD
F. E. WORMSER, *Secretary, Lead Industries Association*

NEW MARKETS AND USES FOR ZINC
RUSSELL B. PAUL, *Mining Engineer, New Jersey Zinc Company*

RECENT TRENDS IN DESIGN AND CONSTRUCTION OF GOLD AND SILVER MILLS
EDWARD L. SWEENEY, *Consulting Engineer*

THE STORY OF SULPHUR
A Motion Picture

12.00 Noon

LUNCHEON—Red Lacquer Room

J. D. CONOVER, *Secretary, The American Mining Congress, presiding*

INTRODUCING:

HOWARD I. YOUNG, *President, The American Mining Congress*

E. A. HAMILTON, *Chairman, Western Division*

WM. B. DALY, *Chairman, Program Committee*

Speaker—WILLARD CHEVALIER, *Vice President, McGraw-Hill Publishing Company*

Address—Industry's Responsibility to Its Government, Its Employes, Its Stockholders.

2.30 P. M.

CHAIRMAN: CLARENCE B. RANDALL
Vice President, Inland Steel Company

PLANNING FOR PRODUCTION OF MINERAL PRODUCTS
DR. C. K. LEITH, *Vice Chairman, Planning Committee for Mineral Policy, National Resources Board*

THE GOVERNMENT'S POLICY TOWARD WESTERN MINERAL STATES
THE HONORABLE JOHN WELLINGTON FINCH, *Director, United States Bureau of Mines*

OUR PUBLIC LAND POLICY
THE HONORABLE HAROLD I. ICKES, *Secretary of the Interior*

Tuesday, September 24

10.00 A. M.

CHAIRMAN: T. H. O'BRIEN
General Manager, Inspiration Cons. Copper Co.

PROBLEMS OF STABILIZATION
ROBT. E. TALLY, *Prescott, Ariz.*

THE WORLD SILVER SITUATION
F. H. BROWNELL, *Chairman, American Smelting & Refining Co.*

THE RELATION OF COMMODITY PRICES AND OUR MONEY STANDARD
FRANK E. GANNETT, *Gannett Publications*

THE CORRECT ECONOMY FOR THE MACHINE AGE
A. G. MCGREGOR, *London, England.*

MACHINES AS SERVANTS OF SOCIETY
RALPH E. FLANDERS, *President, Jones & Lamson Machine Co.*

12.00 Noon

LUNCHEON MEETING

Western Division, The American Mining Congress

2.30 P. M.

CHAIRMAN: W. VAL DECAMP
General Manager, Cardinal Gold Mining Co.

DEVELOPMENTS IN DETACHABLE BITS
Inland Steel Co.—R. D. SATTERLEY, *Superintendent, Greenwood Mine*
American Zinc Company of Tennessee—H. A. COY, *Superintendent of Mines*

DEVELOPING SAFETY METHODS IN METAL MINING
D. HARRINGTON, *Chief, Health & Safety Branch, United States Bureau of Mines*
Discussion giving description of effective safety practice:
WM. B. DALY, *Manager of Mines, Anaconda Copper Mining Co.*
WM. CONIBEAR, *The Cleveland-Cliffs Iron Co.*
GEORGE MARTINSON, *Pickands Mather & Co.*
A representative of the Homestake Mining Co.
A representative of the Eagle-Picher Lead Co.
A representative of the Bunker Hill & Sullivan Mining & Concentration Co.

ADVANTAGES IN USING MODERN EXPLOSIVES
J. BARAB, *Hercules Powder Co.*

R Y PROGRAM

D IVISION THE AMERICAN MINING CONGRESS

Illi nois, September 23-27, 1935

Wednesday, September 25

10.00 A. M.

CHAIRMAN: WM. B. DALY
Manager of Mines, Anaconda Copper Mining Co.

THE SIGNIFICANCE OF SILICOSIS IN MINING

D. E. CUMMINGS, *Field Director, Saranac Laboratory for the Study of Tuberculosis*

METHODS OF UNDERGROUND DUST CONTROL

H. M. LAVENDER and G. B. LYMAN, *Phelps Dodge Corp.*

GEOLOGY OF THE LAKE SUPERIOR IRON DEPOSITS

STEPHEN ROYCE, *Mining Engineer and Geologist*

THE TREND OF ORE TREATMENT AND ITS BEARING ON THE LIFE OF LAKE SUPERIOR ORE RESERVES

CARL ZAPFFE, *Manager of Iron Ore Properties, Northern Pacific Railway Co.*

THE PRACTICAL APPLICATION OF IRON ORE BENEFICIATION TO BLAST FURNACE PRACTICE

E. W. DAVIS, *Superintendent, Mines Experiment Station, University of Minnesota*

12.00 Noon

LUNCHEON MEETING

Sponsored by the Tri-State Zinc & Lead Ore Producers Association

TOPIC: "Industrial Relations in the Tri-State District," by M. D. HARBAUGH, *Secretary, Tri-State Zinc & Lead Ore Producers Association*

2.30 P. M.

CHAIRMAN: D. A. CALLAHAN
President, Callahan Zinc-Lead Co.

INDUSTRY AND THE SOCIAL SECURITY PROGRAM

HERBERT C. JACKSON, *Pickands Mather & Co.*

GOVERNMENT SPENDING OF THE TAXPAYER'S MONEY

LEWIS W. DOUGLAS, *Vice President, American Cyanamid Co.*

THE COST OF GOVERNMENT AND THE VALUE OF PROPERTY

ROSS D. LEISK, *Vice President, United Verde Extension Mining Co.*

LABOR UNION RESPONSIBILITIES

JUDGE JAMES A. EMERY, *General Counsel, National Association of Manufacturers*

Thursday, September 26

10.00 A. M.

CHAIRMAN: R. C. ALLEN
Vice President, Oglebay, Norton & Co.

THE REVENUE ACT OF 1935

A. W. DICKINSON, *The American Mining Congress*

INTERNATIONAL TAX PROBLEMS

H. B. FERNALD, *of Loomis, Suffern & Fernald*

TREASURY TREATMENT OF DEPRECIATION ALLOWANCES

E. C. ALVORD, *Attorney*

12.00 Noon

LUNCHEON MEETING

Speaker—SILAS H. STRAWN, *Attorney*

Address—Fallacy of Higher Wages, Shorter Hours and Increased Taxation as Basis of Prosperity.

2.30 P. M.

CHAIRMAN: HOWARD I. YOUNG
President, American Zinc, Lead & Smelting Co.

FEDERAL INDUSTRIAL LEGISLATION

HARPER SIBLEY, *President, Chamber of Commerce of the United States*

WAGNER LABOR DISPUTES LAW—SOCIAL LEGISLATION — 30-HOUR BILLS

Speakers:

CHAS. H. SEGERSTROM, *President, Carson Hill Consolidated Gold Mining Co.*
J. B. PUTNAM, *Pickands Mather & Co.*
J. P. WILLIAMS, JR., *President, Koppers Coal & Transportation Co.*
D. A. CALLAHAN, *President, Callahan Zinc-Lead Co.*
GEO. P. TORRENCE, *President, Link-Belt Co.*
A. E. PETERMANN, *Vice President, Calumet & Hecla Consolidated Copper Co.*
J. D. FRANCIS, *President, Island Creek Coal Co.* (tentative).

Friday, September 27

SCHEDULE OF TRIPS FOR DELEGATES

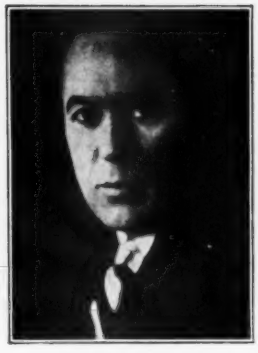
Steel Mills of the *Inland Steel Company*
Whiting Refinery of the *Standard Oil Company*
Lead and Zinc Operations of the *International Smelting & Refining Co.*
Properties of the *Universal Atlas Cement Company*
Rosenwald Museum of Science and Industry

SPECIAL ENTERTAINMENT EVENTS

Sunday—Tea Dance at Palmer House
Monday—"Open House" Get-Together Party, Palmer House
Tuesday—Delegates Party, Famous Empire Room, Palmer House
Wednesday—Annual Dinner-Dance, Palmer House, with an interesting special feature
Thursday—Open for individual entertaining
Friday—Trips as above outlined
Special entertainment throughout the week is being arranged for the visiting ladies by a special local committee, headed by Mrs. H. J. Saladin

J. W. Van Evera

R. E. McCormack
on Committee of Exhibits



Clement K. Quinn

Link-Belt Co.
Lorain Steel Co.
Mancha Storage Battery Loco. Co.
Marion Steam Shovel Co.
McGraw-Hill Publishing Co.
Mine Safety Appliances Co.
Mining Congress Journal.
National Malleable & Steel Casting Co.
Nordberg Manufacturing Co.
Ohio Brass Co.
Philadelphia Steel and Iron Co.
John A. Roebling's Sons Co.
Republic Steel Co.
St. Louis Power Shovel Co.
Sanford-Day Iron Works Co.
Sauerman Brothers.
Standard Oil Co.
Sullivan Machinery Co.
Texas Co.
Timken Roller Bearing Co.
Union Carbide Co.
United States Steel Co.
West Virginia Rail Co.
Ziv Steel and Wire Co.

Mineral States Exhibit

Illinois
Utah
Iron Ore Group
Texas
Idaho
Tri-State Group

Possibly one of the most outstanding features of the convention is the cooperative Mineral States Exhibit. This exhibit will be a combined exhibit showing jointly and for each state the economic importance of metal mining to the United States. It will, among other things, through charts, diagrams, etc., show such interesting facts as the number of men employed, the annual wage paid, state and national taxes paid, industries dependent upon the metal production, communities dependent upon mining for their existence, and such other related data as will present a clear picture of these industries. The entire exhibit will be under the direction of Robert S. Palmer, secretary of the Colorado Chapter of the American Mining Congress. There is perhaps no meeting of greater importance or significance to the metal mining operator than the annual meeting of the Western Division of the American Mining Congress. All of those who have the best interest of their industry at heart will make every reasonable effort to be present at the meeting, September 23 to 27, inclusive, at the Palmer House, Chicago, Ill.

General view of exhibit halls at San Francisco

A Review of the Metal Mining Situation

Tri-State Field
Utah
California
Iron Ore District
New Mexico
Colorado

Tri-State Field

M. D. Harbaugh *

THE ZINC-LEAD mining industry of the Tri-State district faces the autumn with the feeling that the recently improved demand and prices for concentrates are forerunners of better times, even though there is nothing in the picture which suggests a boom, as a look at the statistical positions of zinc and lead will show. This industry, along with business generally, has gone through two years of wabbling uncertainty since it began to emerge from the depths of depression of 1932. The following table shows more concisely than many words the significant facts about it from 1929 through the first half of 1935.

Year	Shipments Combined Zinc & Lead Concentrates Tons	Gross Value	Average Base Price Per Ton Concentrates Zinc	Concentrates Lead	Average Number Mills Operating Mine Mills	Tailings Mills	Total Mills	Proportion of U. S. Mine Production Zinc	Lead
1929	712,935	$34,864,645	$42.42	$88.59	92	22	114	42.7%	11.3%
1930	491,160	17,229,464	31.98	65.16	51	21	72	36.4	6.8
1931	259,395	6,472,720	22.69	44.59	24	12	36	29.2	5.3
1932	205,005	4,058,921	17.63	34.80	12	3	15	31.5	5.0
1933	292,713	8,530,561	26.90	46.79	15	6	21	35.4	9.8
1934	324,489	9,119,509	26.81	39.39	33	13	46	34.8	9.0
1st Half 1935	165,144	4,413,255	25.88	34.90	27	14	41	..	..

It is noted that average zinc concentrate prices during the first half of this year were about $1 lower than in both 1933 and 1934, and lead concentrate prices were about the average for 1932—the worst year. About the same number of mills have operated in 1935 to date as operated in 1934, but the almost complete shut-down of a month, beginning May 8, on account of the strike, slightly reduced the average number for this year to date.

The strike, suddenly called May 8 by the International Union of Mine, Mill and Smelter Workers and put into effect by roving mobs which stopped the operations by threats of violence, brought about practically a complete shut-down of the district for three weeks. However, when it became evident that the great majority of the actual employes in the district were not sympathetic with the strike and had had no voice in calling it, operations began to resume under protection of the National Guard, and by the middle of July were nearly back to their previous status with most employes back at work for their old employers. Despite some trouble with agitators and a few former employes who would not or could not return to work, the strike is essentially a closed incident and at present, operations are practically normal, with over 4,000 men employed in mines and mills. This is the first serious labor trouble in this district within the lifetime of its present residents, and everyone hopes it is the last. The district hopes it can continue the pleasant informal relationship of employer and employe which for so long has been characteristic. By long tradition, wages are varied with concentrate prices and the men have free and easy access to discuss matters with their employers at all times. In fact, the casual visitor might be inclined to misconstrue the "familiar" remarks that frequently pass between employes and their bosses on the job. Wages are being maintained at levels fixed under the Zinc Code.

The operating picture of the past few years continues to change rapidly in the direction of more centralized milling, both of mine ore and of old tailings. Some central mills are treating ores or tailings from several properties owned by the same company that owns the mill; others mill material from various properties on which the mining has been turned over to a separate operating company on some split gross receipts basis; others operate wholly or partly as custom mills. Feed is conveyed to these mills by standard gauge and narrow gauge rail haulage and also by truck. The maximum haul at present is about 10 miles by rail, but soon may be as much as 35 miles when the Eagle-Picher Company begins shipments to its large central mill from the old Oronogo district of Missouri, where it now is sinking a shaft preparatory to reopening some of that ground.

Of nine mills in the district that can be called central mills treating mine ore, the Eagle-Picher and Bird Dog mills are the large ones, with capacities of 225 and 125 rock tons per hour. The Mary M. treats about 50 tons per hour and the others are very small. These mills produced over 31 per cent of the total zinc concentrate output of the field in the first half of this year, whereas in 1932 only 7 per cent came from such central mills. Under a recent transaction, additional large tonnage from several Kansas mines will be diverted to the Eagle-Picher mill. Central tailings mills, of which as many as 14 were recently operating, produced over 13 per cent of the zinc output of the field in the same period. Thus over 44 per cent of the district output of zinc concentrates in the first half of 1935 came from central mills. This may well exceed 50 per cent in the near future on account of the added tonnage to the Eagle-Picher mill and a large new tailings mill just put into operation by Tri-State Zinc, Inc.

Retreatment of old tailings has reached a rather amazing magnitude, 23 such mills at the maximum having operated in August this year. Many of these are very large compared to those of 1929, several treating at least 75 tons per hour continuously. Of the total zinc concentrate output of the field, the proportions produced from old tailings since 1929 is shown by the following figures: 1929, 9.7 percent; 1930, 14.9 percent; 1931, 15.3 percent; 1932, 9.0 percent; 1933, 10.8 percent; 1934, 21.0 percent; first half 1935, 22.0 percent. When it is realized that the average zinc concentrate recovery from these tailings is about 1¼ percent, the recent production of some 2,200 tons of concentrates per 7-day week requires the treatment of over 25,000 tons of tailings per day.

Recent production from mine ore amounts to over 6,000 tons of zinc and lead concentrates per 6-day week, with an average combined recovery of about 7.5 percent, which requires the treatment of over 13,000 rock tons per day. Thus the interesting fact is developed

* Secretary, Tri-State Zinc and Lead Ore Producers Association.

that the tonnage of old tailings that are being retreated at present is about twice the tonnage of mined ore. There is several years' run of these old tailings yet in store, so they will continue to be an important factor in the operating picture of the district for some time.

A recent new move in the Tri-State district has been the dewatering of a considerable area of old mining ground in the Oronogo district of Southwest Missouri which has been idle for many years—essentially since 1919. Five large pumps have been installed since last January and reached a maximum output of about 17,000 gallons of water per minute in June. The flow has declined to slightly over half that amount at present. The Eagle-Picher Company recently took over the enterprise from Frank Childress, and, as noted above, is sinking a new shaft in the area and expects to mine ore for shipment to the large Central mill near Picher. It is evident that this activity in one of the old Missouri fields will encourage further search for ore bodies in that region, which once was the major producing area of the Tri-State district. It remains to be seen what success will attend these efforts.

The fact that zinc-lead ores have been found over such an extensive range of territory in Southwest Missouri, Southeast Kansas and Northeast Oklahoma—in the past more or less fortuitously—lends encouragement to the idea that more scientific prospecting, based upon the accumulated knowledge of the geology of the ore occurrences, eventually may reveal other important mining fields within the outlines of this extensive territory. The U. S. Geological Survey has had a capable party in the district for over a year making an intensive study of the ore deposits. Its work is being continued and should prove of value to the industry in its future searches for ore. At present there are only a few prospect drills engaged in exploration.

Despite the fact that this district mills the largest tonnages of the leanest grade zinc-lead ores in the world, and is essentially a marginal district at best it probably can expect to maintain a considerable place in the mining industry of the future, even though it is impossible to point to very great tonnages of known ore reserves of grades which can be mined profitably at prices such as have existed the past few years.

The Government's policy regarding silver and gold certainly does not tend to help matters for the Tri-State district, either from the standpoint of domestic or of foreign competition. And it is likely that, with the zinc industry of the United States tending more and more to a "self-contained" status and provided its tariff protection is not lessened, the district will have to be content with its share of the domestic market, which in recent years has been about 35 percent, instead of producing over 60 percent of the U. S. mine output of zinc which it once did.

The outlook, however, is not discouraging, and any observer in the district cannot fail to sense a feeling that the industry is in a fairly healthy state and that it will be able to take care of itself in the future if given half a chance, unencumbered by imposed burdens which further upset the normal competitive balance in the zinc industry of the country or destroy the incentive and initiative that successful mining requires.

Utah

A. G. Mackenzie *

WHEN I was invited recently to write something for this magazine on "The Outlook for Mining in Utah," it was expected, I think, that I should produce an indicated number of words with as much enrichment in the form of optimism as my tradition, information and conscience would permit. That is what I usually do in such circumstances and that is what I expected to do in this instance. In fact, I actually began the article along that line. It was interrupted and I have been thinking about the matter off and on since then. This wrecked the original plan, as when I meditate at length on a subject my brilliancy and subtlety, if any, invariably vanish and I say what I really think.

Therefore: I do not know what the outlook for mining in Utah is; I do not believe anybody knows.

Whoever has read thus far and merely wishes to ascertain what I do not know about my own business in my own field should stop at this point. Whoever is curious to review some of the facts and conditions that lead to my confession may follow on. He will travel with me as an individual; but if any of my friends and associates know the answer they have not shared it with me.

I might be presumed to know the answer if anyone here does, as I believe I review as much general information about the industry as any man in this part of the country; that has been my job for many years. Usually I have been able to give answers to such questions with assurance and sincerity, and usually they have been correct, but I do not undertake to do so now.

We have good mines in this state. They have fine ore bodies, are adequately developed, well equipped and under business and technical direction which we and many others believe to be as capable as can be found anywhere. Many of these enterprises have been conspicuously successful in the past. Why not again?

Well, for one thing, the most successful ones in the past have been what you might call guilty of bigness. This was due to the fact that nature arranged things here so that the best way to utilize much of our ores was through large operations. Therefore, we have had many consolidations, which in some instances converted individual failures into consolidated successes, and we now get more than 90 percent of our total ore production from less than a dozen organizations. What's going to happen to them?

We have high local taxation with continuous propaganda to increase it, and are under more or less constant attack from various angles, led in part by intellectuals who have intensified their natural deficiencies by attendance at many universities and accordingly are listened to with considerable reverence. As to Federal taxation, show me anything in the present picture that means a lessening of that burden and I will be much obliged.

We had a splendid labor situation for years and years, with good men whose satisfaction with their wages and conditions was demonstrated by the fact that the average period of employment in the mines for more than two-thirds of these men was 12 and a half years. I do not know what the future labor situation will be or its effects on future operations. I know that in the past labor constituted about 60 per cent of our total mining cost.

Recent prices of gold and silver have been very helpful to us, of course. They account in considerable measure for the continuance of several important operations and I hope and expect they will continue or improve. But gold and silver combined constitute less than 25 percent of our gross revenues, leaving copper, lead and zinc to make up the rest. Copper, lead and zinc tie directly into the general industrial situation, and that opens up a lot of territory.

I listened respectfully to the utterances of eminent business men and financiers about the general situation for many years prior to 1930 and note an occasional chirp from those sources lately. They may know this time, but I am waiting to see. The same goes for eminent economists and business commentators as far as I am concerned. I have taken the time to check up on some of them and find that they usually leave the back door open for purposes of future exit when desirable; just as I should do if I were in the guessing business. The most specific statements come from political sources, and I have learned quite a bit about them, too. For illustration, I recall that one of our statesmen assured me—and all others who happened to be listening to the same station just before the last election—that we should have "an unprecedented mining boom next summer" if we voted right. The indicated summer is pretty well gone now and we know what we know about that mining boom.

These are some of the reasons why I decline at this time to venture an appraisal of the future of mining in Utah. If I shall hereby attain the dignity of designation as "pessimist," "reactionary," "defeatist," "politician," or something like that, it will be all right with

* Salt Lake City, Utah.

me. I have never regarded myself as any of those things, but I am entirely willing to be known as any or all of them if it will help to clear things up for me and for at least some others who gain their livelihood in this industry. You have observed, however, that I have not criticized; I merely note these things and their effect on my own mind.

Anyone who reads this may wonder why I wrote it at all. But such a confession of an average man's perplexity may do good through provocation of an interpretation that he and others may comprehend and rely upon. I hope so, and will participate in the cheers if that takes place. I should like to do something about it myself, single-handed or otherwise. In fact, I have tried to do something about it and point without pride to the results.

Meanwhile: I wish I knew what the outlook for mining in Utah is. It might give us a chance to make money; or save some.

California

G. Chester Brown *

MINING activity in California is confined to a large extent to gold-placer and quartz. The outlook for the year 1936 is very favorable.

The revival of gold mining in the Soledad Mountain District of Kern County has stimulated prospecting in other parts of the state, especially in the desert regions of Southern California. The mill of the Golden Queen mine at Soledad Mountain will be in operation not later than October, 1935, and thus the output of gold from this district will be increased.

The development of new producers in the Grass Valley-Nevada City territory, such as the Lava Cap and the Spring Hill soon to be producing, will augment the output from this district, which is the most active section in California.

The main gold producers on the "Mother Lode" are the Argonaut, Kennedy, Central Eureka and Carson Hill.

El Dorado County is showing renewed life with one large producer, namely, the Big Canyon property. Prospecting is very active also.

Another hopeful sign for gold production is the erecting of cyanide plants to treat tailings. Two plants of 1,000 tons daily capacity each are being built —one at the Yellow Aster Mine in Kern County, and the other at Ione, Amador County.

Gold dredging is showing renewed life as some new territory is to be worked in Placer, Stanislaus and Trinity Counties, so that more dredgers will be operated in 1936 than in 1935.

Hydraulic miners are optimistic on account of the promise of Federal assistance to aid in erecting dams for the storage of tailings.

* Secretary-Treasurer, California Metal & Mineral Producers Association.

Iron Ore District

Carl Zapffe *

LAKE SUPERIOR iron ore was first hauled from a mine to a port in 1844. Because annual production was for a while small, erratic and not accurately recorded it has become customary to regard 1854 as the beginning year of Lake Superior iron ore shipment. Since then records have been accurately maintained. Up to 1935 we have 80 years of continuous shipment to consider. The question is now asked: What is the future outlook?

The past five years are designated everywhere the Depression Period. Lake Superior operators may properly regard it as the sign of the ending of Volume I of an 80-year history and the inauguration of a Preface for Volume II, yet to be made. Consequently, to write now about the outlook of Lake Superior iron mining leaves one almost without material. We might get a clue by resorting to the old and tried method of reviewing the past.

To see things clearly engineers must have graphs and curves. The best known graph amongst Lake Superior engineers is the one that shows the annual shipment record. Time and again it has been used to support speculative views regarding future production. That graph reveals interesting characteristics for specific periods of this industry. In analyzing this graph it may conveniently be divided into three segments. Each such segment reveals major changes.

The first segment I make to cover the period from 1854 to 1896, inclusive. That was the period of childhood. During those 43 years the ore industry was clearly in its infancy in every respect. Shipments rose slowly and steadily from year to year, from nothing up to 10,441,462 tons, with the biggest annual gains starting as late as 1885. That was a huge total. This segment appears as a very even line, sloping upward a little more at the end of the period than elsewhere. If an average line for this segment is projected to 1929, we should have then been producing certainly not more than 15 million, but it proved to become 66.2 million tons.

The second segment I make to cover the period from 1896 to 1916 inclusive. During those 20 years shipments started with 10 million tons in 1896 and rose to a maximum for all time of 66,902,778, in 1916, which then appeared to be only a starter. During the first six years of this period there was a large but very uniform annual increase, but from then on marked irregularities began and we see also a periodicity consisting of two or three successive years of small gain followed by a year of marked decrease. The graph is no longer a smooth line as for the preceding segment. The fear that these marked irregularities caused periodically to the producers was offset in part by the tremendous total gain in tons produced over a decade or two. Capacity to produce was during that time developed to an extent that 80,000,000 tons could have been shipped easily in a a single year. Speculations about future consumptions were frequently published, and to be conservative 70 to 80 million tons became regarded as the likely annual production by about 1940. An average line for this segment has a very high slope upward when compared with the average line for the preceding segment; on such a basis for predicting future production we should be shipping 80 millions in 1935. It will be much less than one-half that amount.

The third segment is the shortest of the three. It begins with 1917 and I end it with 1930, being 14 years of shipments. The average annual shipment for that period approximates 50 million tons. The outstanding characteristic of the graph is its extreme irregularity from year to year. It suggests unrest, instability and great sensitivity, presumably to variable economic conditions. From a maximum of 64,694,636 tons in 1917 shipments dropped to a minimum of 22,851,805 in 1921. In 1921 it was our opinion that bottom had been touched and that lower we could not possibly go without it indicating that mining had ceased completely. In 1923 we were back to the huge total of 60,798,526 tons; in 1924, down again to 43,896,361 tons; in 1929, up again to 66,157,359; and in 1930, down to 47,187,661. We have heard that period described as the "golden 20's." If that was truly a golden decade, and if an average line can be drawn for this erratic shipment record, it is at best a horizontal line and means no gain. We infer therefrom that the industry had become full grown and had reached a uniform rate of progression. Judged by that average line the shipment for 1935 should be 50 million tons, and not 80 million as was in 1920 regarded the likely output for 1935. Everybody seems now to have been in error, and some far in error, because we will do well if, in 1935, we exceed one-half of 50 million tons.

If we were to begin with the peak performance in 1915 and make an average line of the graph for the years 1915 to 1935, we would see a line which in its forward course slopes downward and sharply so. The inference could be that in spite of all the activity and the good that the "golden 20's" seemed to portend for the moment, the industry was actually on a toboggan slide. That interpretation is difficult to accept. We can hear it said promptly that curves can not be used in that way. People do not want to be told of precipitous drops or that their industry is on the wane. We need remember that in those various years many operators were confident that the industry was heading for annual outputs of 80,000,000 tons and would reach it in a few years. How, then, should such a line be interpreted?

In 1930 shipments dropped to 47.2 million tons; in 1931 to 23.5 million; and in 1932 to 3.5 million. The latter figure is so very small that it compares only

* Manager of iron ore properties, Northern Pacific Rwy. Company.

with the shipment made 48 years ago, in 1886, when the industry was but sprouting. We see here a strong contrast because in 1921 the production of 22.8 million tons was regarded indicating complete standstill. Another contrast to note arose in 1933 and 1934, when we shipped the same tonnage as in 1921 and considered it a fair operation, and boding well for the next year. In 1935 we are apt to ship only 27 million tons, but regard it as a good performance.

The material factors which have now entered into the set-up and have made themselves felt as real are the many things which in previous years were listed as likely competing materials and interfering forces but were by the public regarded as calamity howling set up by the industry merely to gain sympathy and concessions. It is needless to list those factors because their effect in total can be explained by stating that in about 1925 the majority of operating companies regarded the life of the Lake ore reserves as very short and all available properties were acquired to guard against the contemplated shortage. Then along came the depression period and in a very short time operators proclaimed that the current inactivity in producing would have the effect of extending the calculated life of the ore reserves by at least 10 years. Ore was at once deemed plentiful and certain kinds of ore and property became regarded superfluous and many million tons of leased ore were returned to fee owners by surrender of the lease-contracts. Instead of now preparing each year for outputs of 50 to 60 million tons, the producers have set their sails to coast along on 25 to 35 million tons per year and regard 40 to 45 million tons as the probable average maximum production for many years to come.

So we may look upon the depression period as marking the end of big expansion, and instead of extending downward the graph of past shipments we may say that we have cut the line and have dropped down to a new starting point for a new rate of activity and a new history, whatever that may become. If that is not done, predictions will go awry, be unsound and be worthless. We need adjust ourselves to an easier pace for the future in producing ore. Our mines are well-developed, the best of equipment and much of it is on hand, only the best men of the former working forces are on the job and production can be raised quickly, if needed, at any time and without much effort or further preparation. We are temporarily over-developed and over-supplied with equipment. Lacking is solely a big demand for ore to show what we can still do. The person who can say for sure when a big and increasing demand will come would deserve a monument erected in his memory. Until then the ore industry will remain as on its toes, raring to go but held in leash and doing only half of what it did in the "golden 20's" and could do again conveniently at any time. We need wait for a better basis for an answer. We have not given up hope but we have given up looking as far into the future as we used to do.

New Mexico

E. H. Wells *

MINING in New Mexico, as in other states, has been adversely affected by the depression. Fortunately, the state's mineral resources are quite varied, and certain mineral industries have gained rather than lost during the past few years. On the whole, the outlook for the future is moderately bright.

The value of New Mexico's mineral production for 1933, the last year for which fairly complete figures are available, was approximately $23,355,000. This production was distributed as follows: Gold, $677,000; silver, $414,000; copper, $1,725,000; lead, $817,000; zinc, $2,598,000; coal, $3,071,000; petroleum, $6,490,000; natural gas, $2,465,000; natural gas gasoline, $654,000; sand and gravel, $777,000; stone, $437,000; and miscellaneous (including clay and clay products, fluorspar, lime, mica, molybdenum, potash salts, etc.), $3,230,000. The value of gold is figured at the average weighted price of $25.56 an ounce for the year.

Metals

Among the metals, zinc has ranked first in value in New Mexico since 1933 and promises to continue in that place. The Pecos mine of the American Metal Co. in San Miguel County has been the largest producer, and the output from this property for the next year or two should compare favorably with past production. The Ground Hog mine of the Asarco Mining Co., the Black Hawk mine of the Black Hawk Consolidated Mines Co., and the property of the Peru Mining Co., all in the Central district, Grant County, should continue to yield appreciable amounts of zinc. The largest known reserves of this metal are in the Central district. The Hanover mines of the Empire Zinc Co. in the Central district have considerable developed ore, but they have been closed down since 1931. Most of the zinc found in the state occurs in complex ores, and profitable mining is dependent on the price of lead, copper, gold and silver, as well as zinc.

For nearly two decades prior to the depression, copper ranked first among the state's mineral products, approximately 90 percent of this copper coming from the Chino mines of the Nevada Consolidated Copper Company in Grant County. This property operated on a much reduced scale during the early thirties, and in the fall of 1934 operations were suspended for an indefinite period. The 85 Mine of the Calumet & Arizona Mining Co. in the Lordsburg district, Hidalgo County, ranked second to the Chino mines in production for some years. It was closed down in 1932, and an early resumption of mining seems unlikely. New Mexico's copper production of the immediate future will come largely from complex ores in which zinc is the most valuable metal.

Lead has always held a subordinate position among the metals, and the outlook is not bright for an early increase in its output. Like copper, it is produced chiefly from complex zinc ores such as are being worked at the Pecos and Ground Hog mines.

The state has large iron and manganiferous-iron deposits, but the mining of these ores will probably not be resumed in the immediate future. These deposits are handicapped by the distance to smelting points.

During the depression, most of the gold and silver produced in the state have been subordinate constituents of complex ores. The higher prices for these metals have resulted in increased activity in a number of camps, particularly the Hillsboro district, Sierra County, and the Mogollon district, Catron County. In the Hillsboro district the ores are essentially gold ores with some copper, but in the Mogollon district the ores are valuable for both gold and silver. Increased production of gold and gold-silver ores is probable in the Pinos Altos district, Grant County, Mount Baldy district, Colfax County, the Nogal district, Lincoln County, and several others.

Placer gold deposits have been worked in a number of districts since the price of gold was increased by the Government, and this type of mining probably has been more profitable in the Hillsboro district than elsewhere. A moderate increase in placer gold production is likely, the most promising districts being the Hillsboro district, Sierra County, Mount Baldy district, Colfax County, Golden district, Santa Fe County, Pinos Altos district, Grant County, Ore Grande district, Otero County, and Jicarilla district, Lincoln County.

Molybdenum has been produced steadily at the mines of the Molybdenum Corporation of America in the Red River district, Taos County, for about 10 years. This metal will probably continue to rank first among the rarer metals produced in the state. A return of pre-depression conditions should be accompanied by mining of maganese ore, particularly in the Little Florida Mountains, Luna County.

Non-Metallic Minerals

The most interesting recent development of non-metallic minerals in New Mexico is that of the potash deposits in Eddy County. Following the discovery of sylvite in a well being drilled for oil in Eddy County, a large-scale diamond core-drilling campaign was carried on by the Federal Government and various companies and individuals. This drilling proved the existence of hundreds of millions of tons of potash salts of commercial grade in the Permian Basin of southeastern New Mexico. The United States Potash Co. has been mining these deposits since 1931, and the Potash Company of America will be in a position to carry on large-scale operations before the end of 1935. The crude potash salts

* President, New Mexico School of Mines.

are milled and the shipping product is chiefly a high-grade muriate. The plants of these two companies will have a total annual capacity of more than 1,000,000 tons of crude salts. Recent reductions in the price of potash salts have severely handicapped this new industry, but the New Mexico companies have definitely proved their ability to compete in at least part of the American markets. Potash should continue to be an important mineral product of the State for many years.

The large-scale road-building program now in effect is utilizing large quantities of sand and gravel, and the requirements for road materials may increase slightly. New Mexico has deposits of a number of non-metallic minerals that will profit to some extent by improved industrial conditions. Among these are fluorspar, mica, lithium minerals, clay, gypsum, barite and salt.

Hydrocarbons

The coal industry in New Mexico has suffered considerably from competition with crude oil and gas as well as from the general depression. The production for 1934 was about half the amount mined in 1929. Any appreciable increase in production will depend on an improvement in general economic conditions. The bulk of the coal will continue to come from the Raton district in Colfax County, the Gallup district in McKinley County, and the Cerrillos district in Santa Fe County. The state has coal reserves, according to official estimates, of 192 billions of tons.

The petroleum (oil) industry in New Mexico has weathered the depression in better fashion than perhaps any other mineral industry. For several years after its discovery in 1929 the Hobbs field in Lea County, one of the major fields of the country, yielded most of the oil produced, but during the past two years other producing fields in Lea County—Jal, Cooper and Eunice—have been proved by drilling to be much larger than was thought originally, and their production has correspondingly increased. The Monument field in the same county, discovered early in 1935, should rival the Eunice field when fully developed. The Lea field, Lea County, Artesia-Jackson-Maljamar field, Eddy and Lea counties, and the Hogback and Rattlesnake fields, San Juan County, should continued to produce moderate amounts of petroleum for some years.

From 500 to 1,000 wells will be drilled for oil during the coming year. The known oil reserves amount to at least 225 million barrels, and unquestionably the reserves will be greatly increased by future drilling. The oil production of the state in 1934 was approximately 16,400,000 barrels with a value of about $12,000,000. The amount produced in 1935 should be about 19 million barrels, and the annual production should increase steadily for some years to come.

Important gas fields have been developed in Lea and San Juan counties. The Jal field in Lea County supplies gas to various New Mexico communities, El Paso, Tex., Douglas, Ariz., and points in northern Mexico. Gas from the Artesia-Jackson-Maljamar field is used extensively in the Pecos Valley, and gas is piped from the San Juan fields to Albuquerque and Santa Fe. A moderate increase in natural gas production seems assured.

Large amounts of carbon dioxide gas have been encountered in wells drilled in Torrance, Harding and Mora counties. This gas is being utilized in the Estancia Valley, Torrance County, for the manufacture of "dry ice" by the Witt Ice and Gas Co. The "dry ice" industry gives promise of expanding rapidly.

Most of the oil produced in Lea County is accompanied by gas, and the extraction of the natural gasoline from this gas has yielded considerable profit to the operating companies. The production of natural gasoline should increase correspondingly with the increase in crude oil production.

Colorado

*Robt. S. Palmer**

COLORADO is forging ahead in the field of metal mining with a great deal of new and renewed mining activity. A splendid record of achievement has been made within the last 77 years, during which time $744,437,000 in gold, $522,600,000 in silver, $218,159,000 in lead; $157,188,000 in zinc; $49,141,000 in copper; $27,500,000 in molybdenum; $7,400,000 in vanadium; $18,000,000 in radium; $19,700,000 in tungsten; $4,200,000 in manganese and millions of dollars worth of other products affiliated with mining industries have been produced. The production trend in this state has been decidedly upward and the principal mill in the state, located at Colorado Springs, has recently been improved at a cost of more than $200,000.

This mill, known as the Golden Cycle, during the first seven months of this year, treated 284,992 tons of ore, having a value of more than $3,402,621.72. Other mills are being constructed at strategic positions throughout the mineralized section of the state. The new mill at Cripple Creek, being constructed by the Cripple Creek Milling Company, should be completed by October 1, and is designed to have a capacity of 500 tons. The Black Cloud mill at Boulder has been remodeled and new equipment has been installed, which will enable operators to take care of larger tonnage. The St. Joe mill, located at Rowena, is the largest operating mill in this district, and the Slide and Big Five mills are also in operation. A new mill has been constructed at Summitville, in Rio Grande county, and this mill is being enlarged to take care of 800 tons of ore per day. There are eight mills in Clear Creek and Gilpin counties, three of which are treating custom ores. The Shenandoah-Dives mill, near Silverton, has been increasing progressively, to take care of 600 tons. At Ouray, the Banner-American Mine Company is operating a modern 75-ton flotation mill. The Telluride Mine and Milling Company is operating the famous Smuggler-Union mine, and mill in conjunction therewith. The King Lease, Inc., is operating the Camp Bird mine and mill and the United States Vanadium Corporation is contemplating the early operation of its extensive vanadium-carnotite properties. The San Juan Metals Corporation is inaugurating an extensive program in this section. A new mill is in the course of construction at Leadville and several are contemplated at Creede.

The Alma district is rapidly becoming one of the most important districts in the State of Colorado and geologists of international reputation are prophesying that huge deposits of gold and silver ores exist at great depth in this district. Some of the largest producers here are the American, London, London Extension and North London mines. Others include the Butte, Excelsior, Magnolia, Oliver Twist Tunnel, Orphan Boy, Paris, Phillips and West London mines. The Climax Molybdenum Company operates the largest molybdenum mine in the world, with a deposit of molybdenum that could supply the needs of the world for a period of 200 years. This operation is located 14 miles north of Leadville. Improvements are being made in this enormous plant and it is said production will be increased to 6,000 tons per day shortly. The Empire Zinc Company's plant, located at Gilman, in Eagle County, is shipping approximately 600 tons daily of crude copper iron sulphides. The Aspen district is especially active, as are certain properties in Gunnison county. The mill at the Carter mine, near Ohio City, is being enlarged to accomodate 200 tons of ore. Without exception the other districts are showing new signs of life.

Ore deposits are being found in Larimer, Jackson, Routt, Moffat and Grand counties. Great things are expected of the Breckenridge, Dillon, Montezuma, Kokomo and Frisco districts.

A new geological report, compiled in cooperation with the Colorado Metal Mining Fund Board, has recently been published on this district by the United States Geological Survey.

Several rich strikes have been made in Montezuma county, and some splendid work is being done in the La Platas. The principal output from Dolores comes chiefly from lead silver ore, which is shipped from Rico.

To show evidence of the increased activity in all of these districts, the production records should be examined.

In the last year Colorado has produced 324,923.32 ounces of gold; 3,475,661 ounces of silver; 11,294,000 pounds of copper; 8,435,000 pounds of lead, and 1,544,000 pounds of zinc. These figures show an increase in production of these metals over that of 1933 as follows:

* Secretary, Colorado Chapter, The American Mining Congress.

Gold, 82,095,000.62 ounces; silver, 1,289,-521 ounces; copper, 1,627,000 pounds; lead, 3,632,000 pounds. In analyzing this astounding increase one finds that the total amount of ore treated in Colorado for this year was 1,309,187 tons, or an increase of 845,495 tons more than in 1933.

The most important increase in tonnage in gold and silver ores was noted in Teller, Park, Gilpin, Boulder, Clear Creek, San Miguel, Ouray, San Juan and Mineral counties. The largest increase in base metal ores was noted in Eagle County, and it was found that gold and silver were associated in this ore in important quantities.

The largest gains in placer output were noted in Jefferson, Summit and Park counties. It is interesting to observe that in 1934 there were more than 929 individual producing lode properties, or an increase of 321 over the 614 reported in 1933, and there were 967 placer operations reported, as compared with the 286 operations reported in 1933.

These figures show that in 1933 there were only 900 operations in this state, as compared with the grand total of 1896 in 1934. These figures, of course, do not include the large number of ever-increasing mine development projects which are as yet not producing.

The manganese industry in Colorado has been discouraged because of the federal policy of lowering the tariff on this metal. Tungsten is produced in Boulder County and a small amount in San Miguel County. During the year ending July 1, 1935, it is estimated that $250,000 worth of tungsten was produced in Boulder county. This metal, like manganese, cannot be produced at a profit in this country without the maintenance of a protective tariff. This is true in spite of the known fact that the largest deposit of pure ferberite known to exist in the world is located in Colorado.

Several radium, uranium and vanadium properties, extensive fields of which are located in Montrose county, near Naturita, have recently been taken over by a substantial Chicago concern. Vermiculite, feldspar, fluorspar, beryl, bentonite, lime, gypsum, mica, jeffersite, bitumen, asphalt and enormous deposits of oil shale are found in the state.

The clay deposits of Colorado are most important and the clay producing industries are increasing their production rapidly. Building sands and gravels are found in abundance as are marbles and granites. The importance of the travertine industry is increasing, and the production of alabaster in Larimer county is fast becoming a significant item.

Colorado is yet to make its reputation as an oil producing state, although some oil is being produced in the state at the present time. Hundreds of farmers in eastern Colorado are paying their taxes from incomes derived from royalty payments received on their lands, said to contain oil in this section. A great many new drills are at work and several prominent geologists predict that Colorado will soon be listed among the important oil-producing states. The Land Board has recently adopted a new policy which has enabled some of the more important oil companies to lease state lands for test purposes. The state itself is receiving a fine revenue from the leases granted to these major oil companies.

In analyzing the mining situation in the State of Colorado, the relative importance of the railroads should not be overlooked. Many of these lines were built because of the mining activity in the early days. Today we find in comparing the total freight shipments of all animal and agricultural products with the products of the mines that were transported over three important railroads, products of the mines comprise 60 percent of the total shipments and 63.5 percent of the total revenue for the years 1933 and 1934.

The increased use of power should also be noted since renewed activity in the metal mines has taken place. The expenditure of more than a million dollars a year by the metal mines in the state, which does not take into account expenditures for power by the coal mines and other important agencies, is certainly no small item. The increased use of power in miners' homes and in general buildings, being rebuilt in mining districts, should not be overlooked.

The diversification of mineral wealth within the State of Colorado has led various writers to refer to this state as the "Store House of Varied Mineral Wealth," or the "Treasure Chest of the Nation." Of eighty important minerals listed in a summary of minerals in the annual book published by one of the leading concerns, Colorado produced commercial quantities of forty-five. Colorado also ranks first in the wide variety of deposits of high-grade stone.

The most important feature of the new Colorado mining program is the long-term planning, rather than the temporary projects which have marked mining history. Undoubtedly planning of this nature tends towards stability and should prove to be highly beneficial to the other industries within the state. The Colorado miner is hopeful that all governmental agencies will refrain from interfering with the progress being made in this all-important industry. Stability is the most essential element desired by the miner of today, and, if allowed to complete his program, a solution of the unemployment problem will become a reality.

THE Hanna Coal Company has established a world's record for safety of operation in coal fields with a record of producing a total of 3,229 tons of coal in 14 months without the loss of a single life.

"A MILLION pounds of copper and copper alloys is being consumed each week by the mechanical refrigeration and air-conditioning industries," according to the Copper and Brass Research Association. "According to present consumption and taking any seasonal slump into consideration, the total tonnage for the year should exceed 50,-000,000 pounds."

IN A RECENT Mines Department Circular, the British Under-Secretary for Mines, A. E. Faulkner, advised owners and managers of coal mines that their rescue regulations would shortly be amended to include equipment for administering a mixture of 7 percent carbon dioxide and 93 percent oxygen in the cases of asphyxiation, carbon monoxide poisoning, or shock that so frequently occur in mine explosions or fires. He urged operators, however, to anticipate the change in regulations by installing the equipment at once. In the same Circular, Mr. Faulkner cited several cases of lives saved through the use of the inhalators, and included a complete description of the proper method of administering the carbon dioxide-oxygen treatment in conjunction with the Schaeffer method of artificial respiration. In a previous Mines Department Circular, issued late in 1933, the Under-Secretary for Mines first drew the attention of British mine-owners to the advantages of administering the mixture of carbon dioxide and oxygen in cases of carbon monoxide poisoning or shock, stating that the treatment had proved to be efficacious in all cases of asphyxiation or shock, from whatever cause. It is interesting to note that, in less than two years thereafter, the inhalators have advanced to the standing of compulsory rescue equipment in British coal mines.

THE output of gold in the Western States, Alaska, Eastern States, Central States, Philippine Islands, and Puerto Rico in 1934, in terms of recovered metal, was 3,108,478.17 ounces, compared with 2,571,259.02 ounces in 1933, according to Chas. W. Henderson of the United States Bureau of Mines. The total gross calculated value of the gold produced (using the average weighted yearly U. S. Government prices of $34.95 per ounce for 1934 and $25.56 per ounce for 1933), was $108,641,311 in 1934, compared with $65,721,379 in 1933.

Eight western States, Alaska, and the Philippine Islands produced 97 percent of the total gold in 1934. Their individual output was as follows: California, 719,063.92 ounces; Alaska, 537,281.83 ounces; South Dakota, 486,118.97 ounces; Philippine Islands, 332,974.00 ounces; Colorado, 324,923.32 ounces; Arizona, 165,000.00 ounces; Nevada, 143,800.00 ounces; Utah, 136,581.52 ounces; Montana, 97,822.00 ounces, and Idaho, 83,-600.00 ounces.

MILL and MILLING

Carson Hill Gold Mining Corporation

By CHARLES H. SEGERSTROM*

THE milling plants of the Carson Hill Gold Mining Corporation have grown up with the mine. Beginning with the 10 stamp mills of the Calaveras Consolidated, in 1921 a capacity of 500 tons per day was reached. Late in 1933 the Carson Hill Gold Mining Corporation completely rehabilitated both the stamp mill and cyanide plant and at the same time changed the flow sheet to increase capacity to an average of over 650 tons daily, without additional equipment or sacrifice in extraction. Further changes and additions have now been planned with the object of treating 1,000 tons in 24 hours. The milling system has been developed to a high degree of efficiency. Investigation over a long period has failed to disclose any changes in equipment or method of treatment that could be undertaken to increase recovery at a profit, and changes tending to further reduce costs are limited to adding secondary crushing to the coarse crushing plant and improving classification in the mill.

The mill has several features peculiar to itself. Most conspicuous of these is the large tonnage handled by each unit of equipment in relation to its rated capacity. Recovery of gold from mill rock is effected by the processes of amalgamation and cyanidation. Stamps are used for intermediate crushing, followed by fine grinding in Hardinge Pebble Mills. Reciprocating tables are used to concentrate the gold bearing sulphides preliminary to regrinding and amalgamation of the finely ground sulphide which then join the table tailing for final treatment by cyanidation.

Location

The milling plants of the Carson Hill Gold Mining Corporation are located at Melones, near the south boundary of Calaveras County. Crushing, stamp, amalgamation and tabling sections are on a hillside overlooking the Stanilaus River, which divides Calaveras and Tuolumne Counties. The cyanide plant also fronts the river about 1,500 ft. east of the stamp mill at the site of the old Melones Hundred Stamp Mill.

Milling Ore

Mill rock is made up of quartz and schists, with the schists greatly predominating, carrying free gold and an average of around 3 percent sulphides. From

* Carson Hill Gold Mining Corp.

the standpoint of milling, the ore is ideal, lending itself to simple, direct treatment. Fortunately the ore is entirely free from association with black slates and so none of the serious complications involved in the treatment of ores further to the north on the Mother Lode are encountered here, a circumstance greatly favoring both cost of treatment and extraction.

Mill and Milling

At the present time the milling plants are handling an average in excess of 650 tons daily.

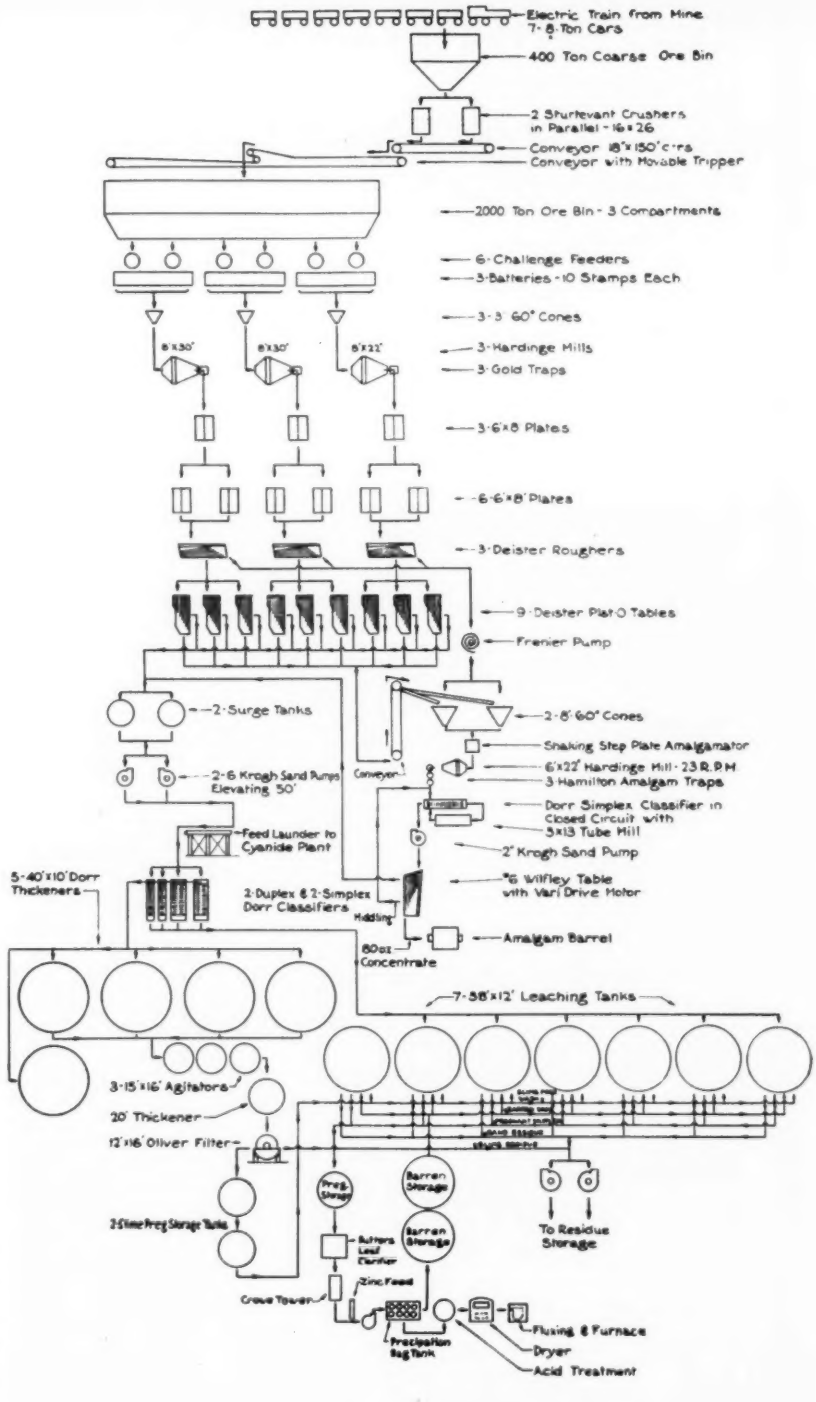
To keep pace with mine development, and to profitably reduce large tonnages of lower grade ores available at surface, power-shovel pits, and glory holes, plans are forward to raise the capacity of the milling system to 1,000 tons per day.

A general flow sheet of the present milling system is shown here. The steps in treatment system may be summarized as follows:

1. Breaking run of mine ore to 3-in. ring size.
2. Intermediate crushing to 4-mesh by stamps.
3. Classification of stamp discharge with cones.
4. Grinding to minus 20 mesh with Hardinge Pebble Mill.
5. Plate amalgamation.
6. Rough concentration of amalgamation tailing.
7. Finishing concentration of rougher tailing.
8. Collection of concentrate.
9. Regrinding Table concentrate to minus 200 mesh.
10. Amalgamation of reground concentrate of shaking step-amalgamator.
11. Tabling reground and amalgamated concentrate.
12. Cyanidation of Tabling tailing and reground concentrate.

Coarse Crushing

En route from the mine to the 400-ton capacity coarse ore bins the loaded mine cars, drawn by General Electric Co. 25-hp. motor, in trains of seven 8-ton cars, pass over a hand-operated Fairbanks platform scale and are weighed by the train crew. The ore cars are of the bottom dump type, constructed at the mine shops. From the coarse ore bins, the ore is fed through chute gates to two 16x26-in. Sturtevant crushers, steel plate construction, each driven by 50 hp. motors. Jaws are made of chrome steel and two sets a year are used. An 18-in. conveyor belt traveling 400 ft. per minute, equipped with magnetic head pulley, receives the discharge from the Sturtevant crushers and delivers it to a distributing conveyor belt provided with tripper, by which the ore is distributed to the mill ore bin having a capacity of 2,000 tons. Both the mill conveyor belt and the distributing belt are driven through a line shaft by a 10 hp. motor. In the plans to extend the capacity of the mill to 1,000 tons a day, the primary crushers will be set to deliver a 4-in. product which will be delivered over a vibrating screen having 1-in. openings to a secondary crusher set to deliver a 1-in. product. Vibrating screens will also be placed before the mill storage bins to segregate ¼-in. material to bye-pass the stamps.



Intermediate Crushing

Thirty 1,250-pound stamps arranged in batteries of ten stamps each and driven by a 100-hp. motor are used for intermediate crushing, preparing ore to suitable size for finishing in Hardinge Pebble Mills. The stamp batteries are fed by Challenge feeders, one to each five stamps. The order of stamp drop is 1-5-2-4-3 at the rate of 104 per minute, with a drop of 7 in. All stamp parts are made by the California Electric Steel Company, Angels Camp, who have developed a special chrome steel for

shoes and dies. Shoes have a life of from 74 to 80 days; dies 30 to 38 days; liners 80 to 90 days. Each battery is fitted with punch steel plate screen having a ⅜-in. opening. The stamp discharge is typified by the following screen analyses and concentration on screened sizes, the results of which show a tendency for values to increase in the finer sizes.

SCREEN SIZING

Product	Weight Percent	Assay $ Au	Distribution of Au
— ⅜ in. + 10 mesh	42.337	2.38	22.61
— 10 in. + 20 mesh	19.610	5.12	22.52
— 20 in. + 40 mesh	12.258	7.50	20.61
— 40 in. + 80 mesh	6.807	8.57	13.07
— 80 in. + 100 mesh	1.926	11.23	4.84
—100 in. + 200 mesh	2.941	7.89	5.20
— 200 mesh	14.121	3.52	11.15
Head	100.00	4.46	100.00

TABLE CONCENTRATION TEST ON SCREEN SIZING

Size	Product	Percent Weight of Size	Percent Weight of Battery Discharge	Assay $ Au	Distribution of Au Cont. of Size Percent	Distribution of Au Cont. of Battery Percent
— ⅜ in. + 10	Concentrate	1.229	0.520	36.38	18.76	4.23
	Tailing	98.771	41.827	1.96	81.24	18.35
— 10 in. + 20	Concentrate	6.916	1.356	45.47	61.31	13.78
	Tailing	93.084	18.253	2.17	38.69	8.86
— 20 in. + 40	Concentrate	8.686	1.065	69.04	79.91	16.45
	Tailing	91.314	11.193	1.65	20.09	4.14
— 40 in. + 80	Concentrate	10.242	0.697	72.76	87.00	11.35
	Tailing	89.758	6.110	1.24	13.00	1.70
— 80 in. + 100	Concentrate	9.868	0.190	103.35	90.85	4.39
	Tailing	90.132	1.737	1.14	9.15	0.45
—100 in. + 200	Concentrate	6.896	0.203	100.44	87.83	4.57
	Tailing	93.104	2.738	1.03	12.17	0.63
— 200	Concentrate	1.975	0.279	100.90	56.75	6.29
	Tailing	98.025	13.842	1.55	43.25	4.81
	Battery Discharge	100.00	4.47	.....	.....	100.00

No amalgamation is practiced in the batteries. Ratio of water to ore in stamp crushing is 3.75:1. At present all the mill rock passes through the stamps and with the feed rate of 650 tons daily the stamp duty equals nearly 22 tons per stamp.

Fine Grinding

Three Hardinge mills regrind the stamp discharge, one for each 10 stamps (one 8 x 22; two 8 x 30). These are driven by a 100-hp. motor through a line shaft placed directly above the drive shaft of these mills at a speed of 20 r.p.m. The main drive is a 16-in. by 6-ply belt and the driving belt for each mill is 14-in. by 5-ply, a tightener being provided for each belt. A hand-operated traveling crane passes over each mill. Nos. 3 and 5 Danish pebbles are used. Seven hundred pounds of pebbles are added daily to the mills. Three-inch white iron liners made by the California Electric Steel Company are used and last seven to eight months. The discharge from stamps is delivered to a 3-ft. classifying cone placed before each Hardinge mill. Cone overflow goes to amalgamation, while the underflow constitutes the feed to the conical mills which discharge the ground material to amalgamation. Due to the high rate of feed, classification in these cones is imperfect. The critical grinding point is between 20 and 40 mesh. Inspection of tailing from concentration show that all sulphide particles are liberated from the gangue in the sizes finer than 20 mesh. Present mill practice shows grinding to 95 percent through 20 mesh. The Hardinge mills are operated in open circuit, the ore passing through the mill directly to amalgamation without classification and returning of oversize to the mill, fineness of grinding being regulated by dilution of the pulp and by the height of the pebble load in the mill. The results of this operation are indicated in the following screen sizing tests, based on samples taken over a 12-hour period.

Size	Battery Discharge	Cone Underflow	Cone Overflow	Hardinge Mill Discharge
— ⅜ in. + 10	36.974	46.127	0.530	1.044
— 10 in. + 20	17.693	27.302	1.765	5.522
— 20 in. + 40	12.155	15.435	7.414	18.101
— 40 in. + 80	7.592	5.444	13.769	21.440
— 80 in. + 100	2.653	1.089	6.708	6.329
—100 in. + 200	4.473	1.709	16.328	14.478
— 200	18.459	2.894	53.486	33.085

In the following classification test it is shown that it is impossible to force the heavier particles of gold and gold-bearing sulphide into the cone overflow, and each size in the spigot discharge assayed from two to three times as high as the corresponding size in the cone overflow.

Size	Battery Discharge Percent Weight	Cone Underflow Percent Weight	Cone Underflow Assay $ Au	Cone Overflow Percent Weight	Cone Overflow Assay $ Au
— ⅜ in. + 10	42.337	49.404	2.69	4.823	1.03
— 10 in. + 20	19.610	25.918	5.68	9.005	2.48
— 20 in. + 40	12.258	13.369	9.41	10.399	3.00
— 40 in. + 80	6.807	5.697	11.68	11.605	2.69
— 80 in. + 100	1.927	1.132	12.30	5.275	3.46
—100 in. + 200	2.941	1.253	6.46	10.776	3.82
— 200	14.121	3.228	1.50	48.116	2.89

In the plans designed to increase mill capacity, 20-mesh screens will displace the cone classifiers now ahead of the Hardinge mills.

Amalgamation

The overflow from the classifying cones and the discharge from the Hardinge mills are distributed over nine amalgamating tables, each having an area of 6 x 8 ft., covered with silver-plated copper amalgamating plates, plated with 2½ ounces silver per square foot. The slope of the tables is set at 1¾ in. to the foot. Each table is provided with traps at both ends and are divided down the center to facilitate dressing. The plates are dressed daily. Twice a month all of the traps are cleaned out; at the end of each month all the plates are steamed and thoroughly cleaned. Squeezed amalgam is retorted in a No. 4 goose-neck retort, having a capacity of 1,800 ounces. Retorting takes two hours and the loss of mercury in this operation is less than 1 percent. The bullion value of an ounce of amalgam is $6.40.

Gold sponge from retorting the amalgam is melted down in graphite crucibles in an oil-fired tilting furnace, using sodium carbonate and borax as a flux. Melting takes one and a-half hours. The bars are sampled by boring two 3/32 holes; one at each end on opposite sides. Bullion is 988 fine, 895 gold, and 93 silver. Fifty percent of the gold content of the ore is recovered by amalgamation and the tendency is for the percentage recovery by amalgamation to gain with increase in assay value of the mill heads.

Table Concentration

The fact that there is a cyanide plant following the mill, and it has been found that a high extraction is obtained from any sulphides in the tailing during the ordinary course of cyanidation, renders unnecessary elaborate concentration equipment.

The flow of pulp from the amalgamation plates is sent to three Diester rougher tables having ⅞-in. stroke and driven at 230 strokes per minute by a 5-hp. motor. The pulp flow over these three tables amounts to around 189 tons per hour (27 tons ore, 162 tons water). Concentrates from the roughers go to a 6 x 8 Frenier pump, elevating it to two 8-ft. 600° cones for dewatering and stor-

age, while the tailing passes on to nine Diester Plato tables driven by a 25-hp. motor and operating 290 strokes a minute. Concentrates from these tables are elevated by bucket elevators to join the rougher table concentrates in the dewatering cones. Tailing from the finishing tables are discharged into a surge tank feeding two 6-in. Krogh sand pumps (one used as a stand-by), which elevates the tailing 50 ft. to a concrete-lined launder 1,500 ft. long, leading to the cyanide plant and having a grade of ½-in. to the foot.

Regrinding Sulphides

Sulphide concentrates from the two collecting cones pass over a shaking stepamalgamator, thence to a 6 x 22 Hardinge conical mill, revolving at 23 r.p.m. Discharge from this mill passes through three Hamilton amalgamating traps, in series, placed ahead of a Simplex Dorr classifier. Oversize from the Dorr classifier feeds a 3 x 13-ft. tube mill operated in closed circuit with the classifier. The speed of this mill is also 23 r.p.m. The overflow from the classifier is delivered by means of a 2-in. Krogh sand pump to a surge box placed before a No. 6 Wilfley table directly connected to a varidrive motor. Three cuts are made on this table; a high grade concentrate carrying free gold, a middling, which is returned to the grinding units, and a low grade product discharged into the mill tail race for delivery to the cyanide plant.

The high grade concentrate assays up to $3,000 per ton. It is collected in convenient cans and twice each month is dumped into a clean-up barrel with ½ lb. cyanide and 500 lbs. of mercury. Residue from this operation is fed back on to the Wilfley table and eliminated by being disbursed in the products of this machine. No. 2 Danish pebbles are used in regrinding the sulphides, the consumption amounting approximately to 4 lbs. per ton of material ground.

Increasing Mill Capacity

The problem of increasing the capacity of this section of the treatment system is not difficult. A secondary crushing unit will be added to the coarse crushing plant to deliver a 1-in. product to vibrating screens ahead of mill bin, dividing it into plus 4 mesh and minus 4 mesh, to be stored in separate bins. The plus 4 mesh material will be the stamp feed, while the minus 4 mesh will join the stamp discharge to 20-mesh screens ahead of the Hardinge conical mills operating in closed circuit with the screens. These changes co-acting together will give the desired increase in tonnage. The changes can be effected without interruption of operation.

Cyanide Plant

From the "Stamp" mill, the tailing, at the rate of 650 tons per day, having a dilution of 1:8, is delivered to two duplex and one simplex Dorr classifiers, separating the material into approximately 55 percent by weight of sand and 45 percent by weight of slime. The slimes are de-watered in five 40-ft. Dorr thickeners and the thickened (ratio 1:1) pulp is pumped by diaphragm pump to three agitators fitted with mechanical agitators. Air under pressure is added to the agitators; Aero-brand cyanide is used. From the agitators the pulp is discharged into a 20-ft. Dorr thickener, used for storage. From the thickener it is pumped to 12 x 16-ft. Oliver filter, without preliminary washing. Washing on the filter with barren solution displaces the soluble gold values from the filter cake. The sand is collected in seven 38 x 12-ft. sand-leaching tanks, previously filled with water. The cycle of treatment averages 10 days. A tank holding 500 tons is discharged, with the time of one man, in eight hours. Pregnant solution from the slime treatment is used for dissolving washes on the sands. The solutions are clarified through Butters filter leaves, de-aerated by the Crowe-Vacuum process, precipitated with zinc dust, and collected in canvas filter bags. Gold precipitate is treated with sulphuric acid; washed, dried and melted in graphite crucibles in a pot furnace. The final bars are 980 fine; 668 gold; and 312 silver.

Total recovery from the original mill head ranges from 88 percent up, in bank funds, according to the head value of the ore. The residue discharged to waste assays around $0.22 and this does not vary to any appreciable extent, irrespective of the head value. The total cost of milling is $0.56 per ton, on present tonnage.

The cyanide plant, designed to handle 500 tons is now treating over 650 tons daily. Several modifications in treatment and flow of pulp and solutions have been worked out to make this increased tonnage possible, without the addition of equipment. The limit of capacity of this plant has now been reached and the plans for treating 1,000 tons per day require addition to classification sand-leaching tanks, thickener and agitator capacities, and filtration. Detailed estimates covering these additions are complete.

Residue Disposal

Residues from the cyanide plant are discharged to two 6-in. Wilfley sand pumps (one stand-by), each having a 50-hp. motor, which elevates the material 60 ft. to a settling and storage dam. A settling pool, covering about five acres at the back end of the dam, completely settles the colloidal slime, giving a perfectly clear overflow to the river.

THE output of silver in the Western States, Alaska, Eastern States, Central States, Philippine Islands, and Puerto Rico in 1934, in terms of recovered metals, was 32,740,642 ounces, compared with 23,310,154 ounces in 1933. The total gross calculated value of the silver produced (using the U. S. Government price of $0.6464646464+ per ounce for 1934 and the average New York price of $0.350 per ounce for all silver in 1933) was $21,165,667 in 1934, compared with $8,158,554 in 1933. The largest silver-producing States in 1934 were: Idaho, 7,410,000 ounces; Utah, 7,111,417 ounces; Arizona, 4,420,000 ounces; Montana, 3,958,000 ounces; Colorado, 3,475,661 ounces; Nevada, 2,850,000 ounces; New Mexico, 1,061,775 ounces; Texas, 854,442 ounces, and California, 844,413 ounces. The combined output of these States was 31,985,708 ounces, or 98 percent of the total United States production.

DIRECTORS of Inland Steel Co. and of Joseph T. Ryerson & Son, Inc. have approved plans for a merger of the two corporations, on the basis of the issuance of 59-100 of a share of Inland capital stock for each share of Ryerson, subject in the case of both companies to necessary action of stockholders and to compliance with applicable governmental requirements.

The plan contemplates the operation of the Ryerson company under its present name and management as a wholly owned subsidiary of Inland Steel Co. It is contemplated that Edward L. Ryerson, Jr., president of Ryerson, will be with Inland Steel as one of its chief executive officers and that three members of the Ryerson board will become members of the Inland Steel board.

Ryerson is the largest independent steel merchandiser in the country, operating 10 large warehouses in the Central West and East. The merger of the two companies will mark the entrance of Inland into the merchandising end of the steel business. The amalgamation is of interest to both parties inasmuch as 75 percent of the various steel products marketed by the Ryerson company can be produced by Inland Steel.

IN A DECISION rendered by the United States District Court for the District of Connecticut, May 13, 1935, the Chaney patents, Nos. 1497543 and 1497544, covering activated vapor absorbent carbon, were held valid and infringed. The suit was brought by National Carbon Company, Inc., unit of Union Carbide and Carbon Corporation, against Richards and Co., Inc., and the Zapon Co., of Stamford, Conn., because the two latter companies were using for solvent recovery activated coconut carbon which had been made by the Barnebey-Cheney Engineering Co., Columbus, Ohio.

The Chaney patents were based on the wartime discoveries of Dr. N. K. Chaney and his associates in the National Carbon Co., Inc.—discoveries that assured an ample supply of highly efficient gas-mask carbon at a time when the need was most urgent. After the war, it was found that this highly activated carbon was equally efficient for a variety of peace-time uses. In 1919 the National Carbon Co., Inc., began the manufacture of activated carbons by the Chaney process for industrial use. Marketing of these products is handled by Carbide and Carbon Chemicals Corp., also a unit of Union Carbide and Carbon Corp.

Safe Practices in the *Potash* Industry

By J. K. RICHARDSON*

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Warren Bracewell, State Inspector of Mines: "I have never found any violations of the State Mining Law; your safe practices exceed my requirements in every respect."

R. J. McGlone, Insurance inspector: "We would like more 'risks' like yours. Apparently, the safety of your employes is given first consideration."

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THERE is no greater influencing factor to the average employe than his desire for security. Not only his personal security, but the security of those individuals who are dependent upon him for livelihood. The security of the entire group is gone when the wage earner is unable to report for work.

We have tried to provide, partially, for this factor, through our safety department. The management firmly believes that "accidents don't happen," but are caused; believing that if the company exercises the proper foresight in planning an accident prevention campaign, and if the worker exercises reasonable care, accidents will cease.

The initial success of our plan is due to this attitude of our management. By word and action they have impressed upon each member of the organization how serious the accident situation is to the company and to the individual. They believe that a good accident record is just as important as a low "cost per ton" record. Their faith in accident prevention has not been misplaced, for the movement has not hindered efficiency, but has been one of the major contributing factors toward greater individual and collective production.

Naturally, the ultimate success or failure of any accident prevention plan lies with the men themselves. Here the men are completely "sold" on safety. We are fortunate in having a labor group which speaks the English language; 95 percent can read and write. Only 7 percent of our entire employe list is foreign born! Few mining companies are so fortunate in this respect, and we have often been congratulated by industrial executives upon the fine type of labor employed here.

This one factor—maintaining a high-class labor by good wages and good working conditions—has done more toward the reduction of accidents than any one single element with which we are familiar. These men are interested in safety; not only at work, but in their homes. Many of them have remarked that they needed their first-aid knowledge at home more often than on the job. They think of accidents as losses of dollars and cents to their families and to themselves. They read articles, and often ask for publications dealing with specific conditions existing here. The safety department has encouraged reading by keeping a well-stocked bookshelf available to these interested individuals.

Someone once remarked that he admired a man who had the courage to correct a fellow worker who was working unsafely. This is not an unusual condition here. Each individual is cooperating with the group! This sounds idealistic, but it is not so—our workers criticize one another when work is being done unsafely. They are not at all adverse to criticizing the management and the safety engineer when they have "fallen down on the job." Our employes have definitely made accident prevention a "bread and butter" proposition.

It is useless to point out the results of our efforts. It should suffice to say that we are gratified at the reduction in severity and frequency which we have experienced. We will never be satisfied until we can go year in and year out without visits from "Old Man Accident."

The general features of our safety organization, such as the safety council, group meetings, investigations, and all those other features which are common to other groups, have been mentioned in articles before, and ours is essentially the same. However, we do have many features which we don't think are common to other organizations, and it is upon those special features that we will deal with here.

In visits to various plants throughout the country, we have all seen bulletin boards of a sort. Posters are sometimes displayed in a haphazard manner, and it is generally the kind of results that they get. We try to make bulletin boards interesting and attractive. In the first place, they are conspicuously placed in spots where they will be seen and read; such as near water fountains, in change rooms, near urinals, and in lunchrooms. Furthermore, the data placed on these boards is regularly and systematically changed. No poster is allowed to grow "cold."

Standard posters, as displayed by the National Safety Council, are used. Displayed with these is the safety department's weekly bulletin. An attempt is made to use posters illustrating the effects of accidents more than those dealing with prevention. Should the safety department be instituting a campaign for good housekeeping or hard-toed shoes, posters relative to the subject are used.

In publishing a weekly bulletin, items of general interest are used. Results of departmental contests are published. The standing of the mine's baseball team and remarks concerning individual players are given. Everything is worked out in an effort to show that safety plays an important part in all of our everyday actions. A space is left under each sheet and comment invited. Criticism of the safety department may at times be rather caustic, but the remarks indicate that the bulletins are read, and some of the comments have originated some excellent "safety ideas."

Suggestion boxes provided with pencil and paper are kept in close proximity to the bulletin boards, and the information gained from this source has been a boon to the safety department.

Safety contests are encouraged among the various departments. The rewards are usually cups given by the management, with a grand prize being the plaque which accompanies our membership in the National Safety Council. These contests occasion much interest, and the results are kept before the men on a unique signboard. A deciding factor in the awarding of these trophies is the condition of the premises of each depart-

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ment. By doing this, cleanliness, with its contributing good features, is stimulated.

A recent visitor to our mine was the safety engineer of a large company. He expressed the cleanliness situation in this manner: "Hell—this isn't any mine, it's the old rock candy mountain." The company has always been noted for the absence of "bad housekeeping" both underground and on the surface.

A complete mine rescue station is maintained by the company. Two crews of five men each are trained once each month, and, in addition to regular training, they are required to make four inspections of their apparatus each month. These team members are given a small amount of additional pay for training and inspection time.

Training with the apparatus usually consists of two hours' hard work in old workings under artificial gas conditions. The life line, safety lamp, and carbon monoxide detector are used in connection with this practice. Walls, brattices and bulkheads are built, and every effort is made to make this portion of the training time practical. After this training period is finished, the machines are cleaned and the remainder of the day is spent studying first aid or working out theoretical problems. In working these problems we use maps of foreign mines as well as our own.

An interesting item that may or may not be of value, is the fact that from this group of specially trained men, practically all of our supervisory personnel has been selected. Their training in ventilation, map reading and safe practices makes them exceedingly desirable as supervisors.

The company maintains a complete first aid station in conjunction with the mine rescue station. These stations are located in the change room. Here can be found beds, chairs, blankets, splints, stretchers, and any other bit of material that might be needed in event of an emergency. This main station is used as a supply station for minor cabinets located in the various departments. It is directly in charge of the safety engineer, who supervises the issuance of material, and treats any injured employe who reports to that station.

As mentioned before, each department is supplied with a complete industrial kit, and in the underground working area, a visitor frequently sees a Stokes stretcher, a bundle of splints and a medium sized red box under a lighted sign reading, "Emergency First Aid Equipment." These boxes carry all the material recommended by the Bureau of Mines, and are located in conspicuous places in close proximity to the working faces.

Many mine operators have complained that they are unable to keep emergency material intact, but we have little trouble. Although we have bragged about a superior labor group, there is a tendency to "rob" first aid boxes. These emergency boxes aren't robbed, because of a novel arrangement.

Working on the theory that the average man won't take anything unless it is loose and easy to get, we have made the boxes so they are readily used in case of emergency, but not readily "robbed." The box has a hinged lid, and near one side is a small glass window. This window is large enough to admit a man's hand. The lid is hooked tightly on the inside, and to open the box, the window must be broken. A false top beneath the window keeps broken glass out of the supplies.

About 95 percent of our men are trained in first aid. The company is more than willing to pay each man for his time during this training, but the safety department has always felt that the individual who does not want first aid training badly enough to take advantage of it when it is offered, probably couldn't pass the course at any rate. Generally speaking, it is thought that this has made for more interest in the courses, and they are better attended than in places where the men are paid for taking the course.

Shaft work—the "bug bear" of all safety departments—is done as safely here as any other operation. We recently completed approximately 1,000 ft. of timbered three compartment shaft with only one lost time accident causing 15 days disability. This record was very good considering the fact that this was the second shaft sunk in this district.

Shaft men were confronted with bad ground and gaseous formations, as well as the other hazards incident to their work. Small pockets of hydrogen, under high pressure were often drilled into, consequently, each man was furnished with approved "Chipper's Model" goggles, to be worn when drilling in certain formations. Each crew was trained in the use of the safety lamp, and when the atmosphere became dangerous all men came to the surface and stayed there until the atmosphere was cleared by auxiliary fans.

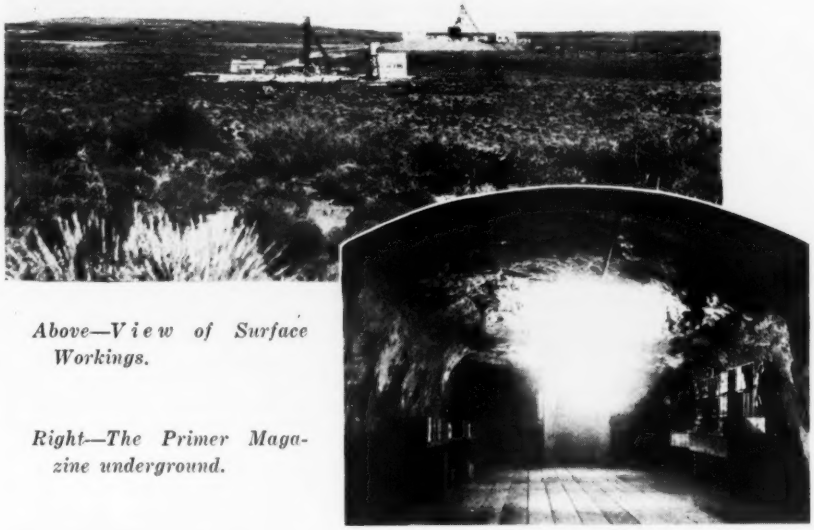
The use of 3-in. scaffolding and safety belts in all shaft repair work has prevented many serious accidents which might have resulted in either death or permanent disability. All shafts are inspected for loose guides and lag screws every 10 days, consequently, we have never experienced a shaft accident of any sort.

Speaking of goggles, we have equipped each man employed by us with a pair of safety goggles. We tried the use of wire screen goggles underground and found them to be unsatisfactory. It was a problem to get a man to wear goggles on special work unless he had them with him, and now, each man carries his own goggles with him at all times. The company charges these goggles out to the men, and in event of leaving the company's employ, their money is refunded. The company furnishes all parts that may be broken in the course of ordinary wear. As a result of this campaign, we have only had one minor eye injury in the last 18 months.

A big factor toward the prevention of underground accidents is good illumination. All main haulage and manways are lighted by 50-watt bulbs placed at 50-ft. intervals. In addition to these, lights are placed over each track switch, and on each side of ventilation doors. All working faces are lighted by 100-watt globes, which makes for excellent illumination in the working place. Anyone would think that this were enough light; however, each man is equipped with a Model K, Edison cap light. No one can complain that they can't see potential hazards!

We are especially proud of our method of handling explosives. The fact that this company has never had an explosives accident justifies the additional expense that this system entails.

All blasting here is done electrically. This work is done by a trained "graveyard" crew. It is their duty to load the



Above—View of Surface Workings.

Right—The Primer Magazine underground.

drilled holes, put the primers in place, hook up the leg wires, attach the leads to wires from a reel (capacity 400 ft. wire), guard all entrances to the danger area, reel out the line to a guarded opening in breakthroughs, energize the circuit by plugging it in a switch attached to a battery locomotive. By working "against the air," they remain at all times in fresh air. The last hour of the shift is spent inspecting the places blasted for missed holes, loose powder, or anything else which might constitute a hazard to the mining and mucking shifts.

Twenty-four hours' supply of dynamite is stored underground in a locked magazine. Keys to this magazine are carried only by the blasting boss and the magazine keeper. Lighting is electrical; the power entering through a switch box located outside the magazine, and equipped with 10-ampere fuses. From this box, the electricity enters the magazine through conduit. Bulbs are enclosed in gas proof bowls. The flooring in the magazine is of 2-in. wooden planking with all nails countersunk. No metal tools or equipment are allowed in the magazine.

The dynamite magazine is connected to the primer magazine by means of a small 4-ft. by 10-ft. drift, through which runs an 18-in. gage track for handling dynamite. No primers are made at the face, all being prepared by experienced powder men at the primer magazine. We have found that by having these men prepare the primers it reduces the number of missed holes, for each cap is properly inserted in its cartridge, cap tested and shunted before being sent to the working face.

Here, we employ a check system which has proven very satisfactory, and might prove helpful to other mines confronted with a checking problem. Each man employed is assigned a number, and this number is stamped on duplicate brass washers. These washers are hung in the timekeeper's office when the employe is off shift. When the employe goes underground he is issued one check; the duplicate is hung on the the underground board in the timekeeper's office. When the man reaches his working level, he hangs his check on a numbered board which is a duplicate of the board in the timekeeper's office. At the end of the shift, the shift boss easily ascertains whether or not the entire mine is clear by consulting this board, for each man as he enters the cage takes his numbered tag from the board, turning it in at the timekeeper's office when he reaches the surface. This method of checking is especially good where blasting must be done on all shifts.

Our ventilation system is not complex, being merely a single circuit throughout the entire workings. Development at the present time has made necessary the building of overcasts, but to date, none have been used, ventilation being entirely directed by doors. We have done away with the human element of failure, in that we do not employ "trappers" at our doors, all doors either being automatic, using a third rail, or controlled by air cylinders which are in turn activated by levers located alongside the haulage way, approximately 200 ft. on each side of the door. The "nipper" throws the lever, and opens the door. Should the door fail to open, the distance of 200 ft. is sufficient to give the "nipper" and the motorman time to get the train under control or jump if necessity rules.

The tenacious texture of overlying salt stratum leaves our underground workings entirely free of timber; consequently, our fire hazard underground is not great. However, the possibility of a shaft fire in our downcast shaft has not been overlooked, it being realized that in the single circuit system, carbon monoxide might possibly overcome some of our men before they had an opportunity to escape. We have, accordingly, erected a fire door, controlled at the shaft station by a lever and located in the main intake. By closing this door, the air circulation is stopped with the exception of such leaks as may occur. The cage tender is always present at the station and it is his duty to close the door and signal the employes by flashing the danger signal on the lights. In signalling a fire underground, the surface

Helmet Crew

hoistman is also notified and he spreads the alarm on surface.

When a fire signal is received, indicating a fire in the downcast shaft, all men proceed to the upcast shaft station. By closing two doors an air lock is formed, thus reducing any danger which might be present. Should a shortage of air occur, compressed air lines are run entirely around this lock, and are perforated to allow for good circulation. The air line runs down the upcast shaft to insure its operation in case of fire. A cage is kept at our working level to hoist away all men in event of an emergency. However, a hoistman is not kept permanently at this hoist, and the air lock is a precaution taken to insure the men's safety until a hoistman arrives and the fan is put under control.

Mining at the present time is done on only one level. Until recently all ore had been mined on a double entry panel system; all entries being driven 20 ft. wide on 70-ft. centers, rooms 40 ft. wide on 80-ft. centers, and room breakthroughs 20 ft. wide on 100-ft. centers. All ore is undercut, drilled and blasted. Drilling is done by electric auger drills. Undercutting is done by Sullivan CR-3 short-

Guarded Transformer Station

wall mining machines. The average height of ore is 10 ft.

It can be seen that when work is being done in such high faces and across such areas drilling must be done with staging of some sort. Drills are mounted on columns which are set on metal stools. Drillers work off a 4-ft. staging supported at one end by a metal "horse," and at the other by an iron ladder against the face. Their drilling boards are of hardwood, reinforced at each end by metal plates to prevent splitting and breaking. On one end is a hook which keeps the board from slipping off the ladder.

Probably all undercutter men have at one time or another narrowly escaped (some haven't escaped) injury by a falling "jackpipe." We underwent the same experience. In order to get away from this hazard, holes were drilled at convenient intervals as close to the face as possible, in the floor. The undercutter operator inserts a specially made 1½-in. iron pin in these holes, attaches his pull cables to these and uses them instead of "jackpipes." Since installing this system, we have not experienced any injuries in our undercutting operations.

On the surface, all moving pulleys, shafting, gears, and flywheels are guarded. All men working with heavy material, such as mechanics and roustabouts, are required to wear hard toed shoes. The entire working personnel is provided with a very modern and up-to-date change room with individual lockers, steam heat, hot and cold running water, and a separate place for hanging their working clothes where they may air and be entirely separated from their good clothes.

The very fact that we have only experienced two minor injuries, due to accidents, in the past eight months is very gratifying to us. It seems to definitely prove that these various aids are helping us and will continue to do so. Not only from the standpoint of lower accident costs, but they will help us from the standpoint of improved employe morale, and consequently improve our individual and collective production records. We have quit thinking that the safety engineer is a "knight in white armor," who is going to save the men in spite of themselves. Instead, we think that if the men are given a fair opportunity to cooperate with an accident campaign they will do so. We are proud of our safety achievements and of those employes who have made them possible.

Clear Creek *Dry-Reclamation* Placer Gold Mining

By CHARLES M. SCHLOSS*

HISTORY records that, as early as 1859, the gold-bearing gravels in the upper part of Clear Creek, near Denver, Colo., were worked by hand. Even with some of the cheap Chinese labor available, the primitive methods of that day did not yield gold in sufficient quantities to compensate for the exorbitant cost. Nevertheless, intermittently for 70 years pork-and-beaners have worked on the creek. It has been known that commercially interesting values were present, if the deposits could be worked on a large scale, but large boulders, narrow canyons between gravel basins, and the prevalence of dangerous floods, have prevented the use of bucket-line or ladder dredges, the previously accepted type of equipment for this class of work. Hence there remained millions of yards of gold-bearing gravel susceptible of profitable exploitation if a method of operation could be evolved.

Humphreys Gold Corporation, of Denver, owning leases on miles of Clear Creek gravel, addressed itself to the evolution of such a method. In 1933 a small-capacity experimental outfit, similar to those that are used very successfully in California, was set up. Digging of gravel and removal of large boulders were done by two gasoline crawler draglines. Gravel, dug under water, was dumped by the draglines, which traveled on land, over a grizzly into a hopper on a pontoon-mounted scow floating in a pond, which followed the excavation. The undersize through the grizzly passed into a washing screen and gold-saving sluice box.

This equipment was inadequate; several things were wrong; boulders wedging between the grizzly bars caused much breakage of bars, and loss of time; it was impossible to control the digging under water, and considerable gold values were lost; the inability of draglines to dig effectively at appreciable depth was responsible for failure to keep the excavation right down to bedrock where best values are generally found; and of course, the capacity of the buckets was reduced seriously when excavating in water and yardage further reduced by double-handling the oversize from the grizzly. However, the experimental plant definitely proved two valuable facts—that the gold was present in the gravel in paying quantities, and that the gold could be removed from the gravel with comparatively simple sluice box apparatus.

With the background of the 1933 summer and autumn operation, late in 1933 negotiations were concluded with the Link-Belt Company which led to the construction of a crawler-mounted screening-stacker plant which has been working during the placer season since May of last year. In its design, the purchaser and manufacturer worked closely together to secure an equipment suitable for the difficult job it was to perform.

Figures 1 and 2 graphically picture the topography and method of operation. Two draglines, one digging on each side of the stacker plant, discharge into its hopper (Fig. 3), from which a heavy-duty apron feeder slowly but uniformly conveys to the trommel screen. Just before the gravel enters the screen, a wide stream of water meets it. Oversize from 1¼-in. perforations, after encountering a second stream of washing water entering the lower end of the screen, is discharged onto the stacker belt and carried to the stack pile. Small material passing through the screen perforations, with the water, falls into a sump from which it is pumped through a pipe line to sluice boxes mounted on a separate crawler base. This passage through pump and pipe line gives an additional thorough scouring of great value in liberating gold values from clay. Gold is caught by Hungarian riffles in the sluice boxes; the tailings are discharged from the boxes directly into the creek, and carried away by the swiftly-running water. Frequent tests have shown high efficiency for the sluice boxes in separating the gold and tailings.

The shovel on bed rock, far from the point where the stacker receives gravel,

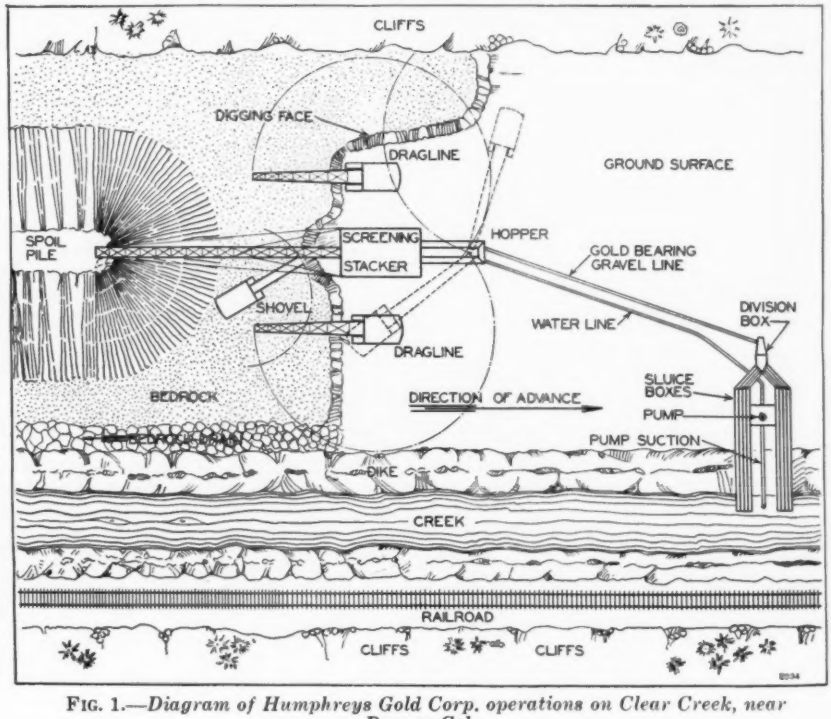
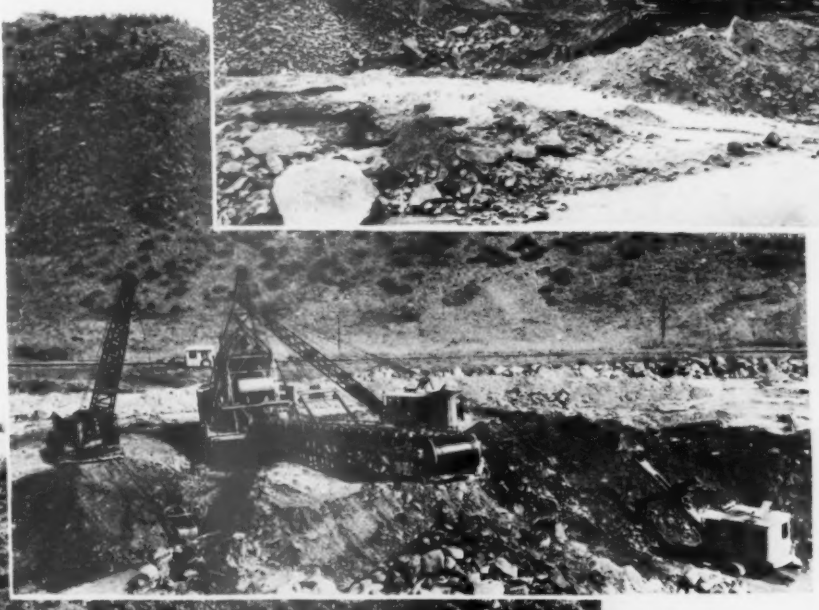


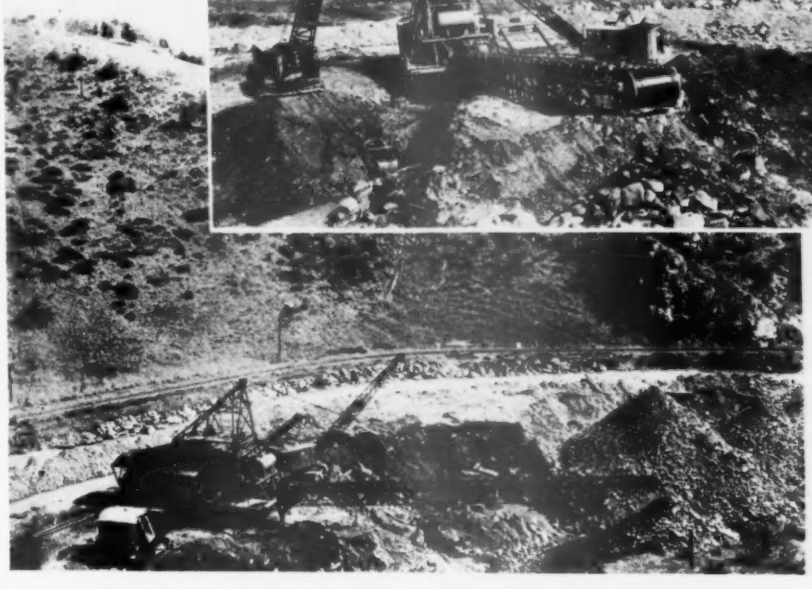
FIG. 1.—*Diagram of Humphreys Gold Corp. operations on Clear Creek, near Denver Colo.*

*Engineer, Link-Belt Co., Denver.

has an important job. It moves boulders out of the way, and digs around those too large to move. It digs the gravel at the toe of the face, which the draglines cannot get easily, and casts it high enough on the face so the draglines, operating on ground level, can readily fill their buckets. It does the same for the peninsula jutting out from the face, underneath the stacker boom and out of reach of the draglines. Last, but far from least, it cleans the gravel from the bed rock and digs up the top decomposed part of the bed rock where some of the best gold values are found.

Ordinarily, bedrock drainage is possible. Occasionally, conditions arise which prevent this, and it is necessary to use a pump mounted to keep the pit dry. Much of the success of the operation is due to the fact that the pit is kept substantially dry and that gravel is not dug under water.





Above, FIG. 3. *At right are shown the receiving hopper and apron feeder to screen of stacker plant.*

Left, FIG 2. *A good general view of Link-Belt built portable screening-stacker plant, crawler shovel, and two crawler draglines.*

Below, FIG. 4. *The meandering creek; with gravel reclaiming and screening plant in foreground.*

The stacker plant was designed to meet a very exacting and rigid set of conditions. It had to be mobile enough to travel as a shovel or dragline travels; time required for moves meant loss of production. It would also be necessary to travel considerable distance through the narrow barren canyons separating the wider basins containing commercial gravel. The feeder, screen and stacker must be large enough and rugged enough to handle large boulders (rocks as large as 42 in. long by 18 in. by 20 in. in cross-section have gone through the plant without trouble). The stacker boom must be long enough to discharge the oversize safely back of the bed-rock digging operations, and long enough so the discharge height under the head pulley would be sufficient to permit stack-piling of any depth deposit found on the creek. The stacker plant above the crawler base, including the boom, must swing in order to follow the meandering of the creek, as shown in Figure 4. All parts must withstand abrasive action of the sand and gravel.

How these conditions were met can be realized from these notes: The massive crawler base (Fig. 5) consists of two wide crawler tracks supporting a heavy welded structural steel frame carrying the propelling machinery, which is operated by levers from a control station above. Immediately above is a large diameter combination rotating gear and roller path, serving the dual purpose of acting as a track for support of the upper rotating platform and for rotating. A king pin, necessarily large, centers the upper rotating platform. On this rotating platform are the washing and screening machinery. On the one end are a heavy duty hopper and a steel apron feeder traveling on large-diameter stationary rollers—carried by well-braced frames projecting from the rotating platform.

The dredge-type screen, with its 1-in. thick screen plates and open ends, is large enough to permit a tall man to stand erect in it. Carried on four rollers, it is driven by pinion and bevel gear ring.

The stacker boom (well shown in Figs. 2 and 3), slightly longer than 100 ft., equipped with anti-friction idlers, is hinged at its lower end to the rotating platform, and is held up by cables led over sheaves at the top of a mast, to power-actuated drums for raising and lowering. The belt is driven from the lower end.

The sump under the screen is made with sloping bottom to concentrate the gravel toward the suction pipe and pre-

vent trapping of gold. From it, an 8-in. manganese steel enclosed impeller single-suction dredge pump, direct-connected through a gear reduced to a 150 hp., six-cylinder gasoline engine, forces the sand, gravel and water through a heavy rubber hose to an 8-in. welded steel pipe line leading to the sluice plant.

Clutches are provided for engaging and disengaging the various parts, as necessary. All machinery except the separately-driven pump, is driven by a 150 hp. six-cylinder engine.

The crawler base of the sluice plant insures mobility equal to the stacker and digging equipment. Gravel and water entering through a hose connection from the 8-in. pipe line, are spread by a division box with adjustable wings, into eight steel-plate sluice boxes. Mechanisms are provided for leveling the boxes cross-wise and changing the slope length-wise. The riffles are made of steel bar gratings in sections about 4 ft. long for easy handling. At cleanup time, feed is shut off from two of the eight sluices at a time, and concentrates are shoveled into a feed hopper discharging into a narrow sluice on top of the plant. Fine concentrates drop through a screen in the upper end of this sluice and thence through side-delivery holes into a second narrow sluice in which they are further concentrated. Coarse concentrates are likewise further concentrated in the first narrow sluice. The tailings from both sluices discharge into the large, main sluices to insure against loss of gold. Coarse concentrates from the first narrow sluice are hand-panned, and nuggets recovered are ready for the mint. Fine concentrates from the second narrow sluice are amalgamated in an arrastra on the plant. Amalgam is retorted, and the retort sponge shipped to the mint with the nuggets.

A 10-in. single-suction open impeller centrifugal on the sluice plant with suction hose in the creek, pumps wash water through 10-in. pipe line to trommel screen on the stacker. A small centrifugal pumps from the creek to the division box, as more water is required for concentration than washing.

All machinery on the sluice plant is driven through clutches from a single 4-cylinder 100 hp. gasoline engine.

Setting up the sluice plant after a move requires several hours, due to leveling up and arranging the pump suction. The long pipe lines between sluice and stacker plants permit a number of moves of the stacker plant, which require but a few minutes each before the sluice plant must be moved.

During the fall of 1934, conditions were fairly good. At that time, with digging being done with one 1¼-yd. and one 2½-yd. dragline, one month's work of 27 operating days yielded 47,259 cu. yds. of gravel, bank measure (in the solid), averaging 1,750 yds. per day. During another period of 30 working days, yardage was 55,277, or 1,840 yds. per day. This is equivalent to 2,300 yds. of loose material daily. This year, due to an exceptionally heavy run of large boulders in the deposits, yardage has been reduced. Operations have also been

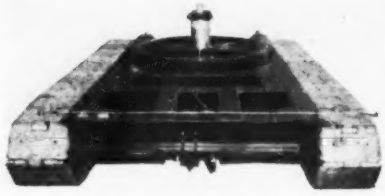


FIG. 5. *The massive crawler base of Link-Belt stacker plant*

handicapped by high water, which required using one of the draglines for levee building operations. Fortunately, the gold values have been excellent, compensating for lesser yardage.

The mobility of the equipment was proved in March, when it was necessary to skip an area of barren ground about seven-tenths of a mile long. The plant shut down Thursday noon; the move started with the shovel leading and improving the creek bed sufficiently for the sluice and stacker plants and draglines to move easily. Sunday noon, the move was completed, the equipment was set up in the new location, and digging operations were started. When one considers the rough nature of the creek bed, this is a remarkable record. Compare it with the task required to move a dredge that distance.

For each of the two shifts, the operating crew consists of two dragline runners, one shovel runner, one stacker plant operator one sluice box attendant, two mechanics and one foreman. One-man shift is required for daytime sampling of the face. Two men are employed, one shift, for clean-up, etc., though one of these men also cares for timekeeping. Two cooks complete the personnel, all of whom come under the charge of the superintendent, on the ground.

Gasoline consumption for all equipment averages 500 gallons total for the two shifts, per day.

Book Review

CORROSION: CAUSES and PREVENTION

By F. N. Speller

Second edition, 694 pages, illustrated, bibliography, author and subject indexes. McGraw-Hill Book Company, New York, 1935. Price, $7.

RECENTLY, we listened to a good address, with experiments, on corrosion by H. V. Churchill, chief chemist for the Aluminum Company of America, before the Pittsburgh Section of the A. I. M. M. E. The author of this new book joined in the ensuing discussion. The behavior or "morality" of metals, particularly aluminum, was reviewed. The more or less practical paper was especially instructive. Now, after nine years, during which period 3,000 articles have been written on corrosion, we find Speller's second edition as useful practically as his first edition.

Following a 45-page chapter on the nature and mechanism of corrosion, in distribution of attack, are two chapters on the influence of methods of manufacture of iron and of factors internal to the metal's composition. How iron and steel are made and fabricated is described and quality-control is considered more important than a large tonnage. Excepting the ferrous alloys high in chromium, nickel, or silicon, as a rule the composition of iron and steel has relatively little influence on the corrosion of metals exposed under water or underground, where only a limited amount of oxygen is available; but in water containing free acids or acid-forming compounds, or under alternate wet and dry conditions, as in a corrosive atmosphere, composition of the metal is relatively a more important factor.

Factors external to the metal itself are of such greater significance than factors internal to the metal, and 40 of the former are discussed in Chapter V. No one factor can be considered as acting alone and independent of all the others. There are five main types of corrosion: (1) atmospheric, (2) under water, (3) underground, (4) chemical, and (5) electrolysis; and in Part II of the book are eight chapters on preventive measures. First, the controlling factors are reviewed, then follow such protection as nonmetallic coatings—paint, cement, and others, and metallic coatings—aluminum, chromium, tin, zinc, and others; removal of dissolved gases; treatment of water in boilers and heating systems, including their care; petroleum refinery and pipeline problems; the problem of acid mine water; soil corrosion; and mitigation of stray-current electrolysis. All of the details are based on the author's experience and the opinions of 500 references cited in the text.

Methods of corrosion testing have not yet been standardized, but a single test for all conditions met in service is not to be expected and would be misleading. Although accelerated tests have value, it appears from Chapter VI that unless all the important factors and conditions found in service are included, such tests will be doubtful. And the practical value of any corrosion test depends largely upon proper interpretation of the results.

Naturally, Speller, being a steel man, devotes some space to the relative merits of steel and wrought iron, particularly in the chapter on the relative corrosion of ferrous metals. He considers many opinions based on service tests and concludes that "the great preponderance of evidence points unmistakably to the conclusion that there is no inherent difference between these materials with respect to durability."

A final statement on corrosion includes this:

". . . It may now be said that there are very few situations where some economical remedy cannot be applied by changing the environment, or by building up the corrosion resistance of the metal."

Seven pages of the appendix list the materials of construction used in handling the common chemicals. They include cement, metals and alloys, rubber, silica, stoneware, and wood.—*M. W. von Bernewitz.*

Safety at *Bunker Hill* Smelter

By P. C. FEDDERSEN*

WORKMEN at the Bunker Hill Smelter when entering the plant through the change house and the time office gate pass directly by a safety-first bulletin board, upon which safety posters are displayed. At the top of the board is a row of 31 green lights, consecutively numbered for each day of the month. Below this is a second row of lights, each representing a certain department, the name of which appears above the light. At the end of each accident-free day the green light for that date is turned on.

Should a time-lost accident occur (if a man does not report for work the day following his injury it is considered a time-lost accident) the green light for that day is replaced by a red light, and in addition the department in which the accident occurred is designated by a red light.

One prominent result of this system is that the men dislike to have an accident in their department publicized by a red light, and all this serves as a constant reminder and an extra incentive to the employes to work safely and to cooperate with their fellow workmen in avoiding injuries.

Constantly changing safety bulletins are given an extensive space on the lower portion of the safety-first bulletin board.

For efficient enforcement of safety regulations all foremen are made safety conscious. The following are some of the points stressed:

1. Report all accidents, even though minor, and if at all serious send the injured to the hospital for treatment. First-aid cabinets, always completely equipped, are maintained in all departments so that minor cuts or burns may be properly cared for, and it is the foreman's duty to see that this is done.

2. Have adequate guards maintained around machinery in motion.

3. Goggles must be worn by those doing work hazardous to the eyes.

4. Keep all tools in sound, workable condition.

5. Encourage men to wear safety shoes, which are sold by the company at cost. Men handling pig lead are compelled to wear heavy metal toe guards.

6. Reduce fire hazard by preventing rubbish from accumulating. The plant is equipped throughout with electric fire alarm system and adequate fire fighting apparatus.

7. When safety appliances are installed instruct men in their application and then enforce the use of such appliances.

8. Probably the greatest hazard around a lead smelting and refining works is the danger to health caused by inhalation of fumes and oxides of metals. When first employed each workman is given a card instructing him in regard to the hazards of lead fume and oxides. The card also instructs him in the precautions necessary to be taken against such danger. It is compulsory for men to wear respirators when handling these materials, and to sprinkle freely to reduce dusting to a minimum. When men are employed for part of a shift only, at a particularly dirty job, such as cleaning flues, they are required to go to the change house for a shower and change of clothes before starting on other work. Each department is provided with a small wash room adjacent to a lunch room, wherein each man must thoroughly wash before eating.

At the change house a man is in constant attendance to keep the house clean and maintain the hot water supply for baths. Here, also, the employes' work clothes, including underwear and shirts, are washed frequently in a modern laundry plant which is included in the building.

The employes are urged to bathe daily, and likewise to make full use of the laundry service provided free of charge by the company.

All furnace spouts, kettles, and other places where dust and fumes arise are provided with adequate ventilating hoods, with discharge into the flue system.

All employes are encouraged to drink milk freely. In order that they all may have this advantage milk is dispensed below cost at the dry house.

A number of employes are trained in first-aid work and are available should they be needed.

In case of serious accidents stretchers are available, and ambulance service is maintained to transport the injured to the hospital, which is less than a mile distant from the smelter.

*Assistant Superintendent.

Some Phases of *Eagle-Picher's* Central Milling Project

By R. J. STROUP*

IN 1932, at almost the low point of the depression, Eagle-Picher had under construction, south of Picher, Oklahoma, a central concentrating plant, designed to take its feed of zinc-lead ores from an unlimited number of different mines, and potentially causing the abandonment of every other Eagle-Picher milling operation in the district. To date 30 milling plants, representing an investment of around $5,000,000, have been abandoned and most of them dismantled in favor of the larger and more efficient plant. Now, after nearly three years of operation the advantages and disadvantages of such a project are no longer theories but have become proved facts.

From its inception it was realized that the success of any central milling enterprise that might be undertaken depended largely on two factors: first, an adequate and cheap transportation or gathering system to bring the ores from the various widely scattered mines to the mill; second, a positive and accurate method of accounting for every equity involved in the various ores according to origin. Many interesting articles may be written about this plant but the scope of this paper is necessarily limited to the solution of these two problems. Along with the formidable array of landowners, royalty owners, operators and others, was the Department of the Interior, representing the restricted Indians. There were many other problems, legal, mechanical and metallurgical that at times appeared paramount but were always dwarfed by the primary conditions that had to be met to insure the success of the project.

The first prerequisite was fulfilled by securing trackage rights on the existing network of tracks of the Frisco and the Northeast Oklahoma railroads within the mining area, building what additional track was necessary to reach the hoppers at the various mines, and putting company operated equipment to work on the rails.

The second condition was taken care of by installing the lot or batch idea and carrying it completely through the origin, transportation, weighing, sampling, assaying and accounting stages. It involved an interlocking of ore movements through transportation, primary crushing and sampling stages that is positive, and the installation and operation of a sampling system entirely mechanical and above criticism, and applying the various data obtained in as near a theoretically correct manner as practicable.

Zinc concentrates are loaded mechanically into cars from this hopper. The car rests on scales while being loaded.

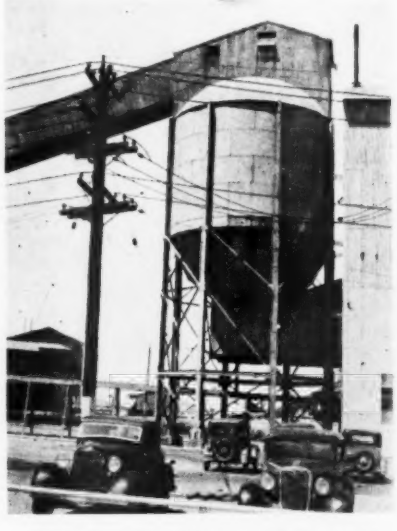
With this prelude let us elaborate. By referring to the map it will be seen that the network of Frisco and Northeast Oklahoma tracks extend to nearly every property involved. From this network 22 spur or branch tracks have been built into the ore hoppers at the various shafts. The longest of the company constructed tracks is 3,806 ft. and the shortest 740 ft., with a total combined length of 5.54 miles. These tracks are for the most part constructed on flat prairie country, have but few bridges and are cheap to construct. In addition to the individual mine spurs there have been built 2.85 miles of track which constitute the central mill yards.

The question of cars for transporting the ore was settled by the purchase of 12 24 cu. yd. dual side pivot drop door cars of Western Wheeled Scraper manufacture. Since October, 1932, when these cars were put into use, they have been coupled almost continuously onto a leased Frisco engine of the 822 class and have handled 2½ million tons of ore without even a spare. These cars have a rated capacity of 80,000 lbs. and weigh 52,300 lbs. each. The 12, which constitute the usual train, easily carry 500 tons which is about the capacity of the larger field hoppers and is also the capacity of each of the four subsurface hoppers at the central mill, into which the incoming ore is dumped.

Normally, three 8-hour shifts are used on the ore haul. Out of this time the crews find time to coal, clean fires and make minor repairs. About 5,500 tons is the normal daily feed to the mill. A fairly rigid schedule is necessary to a part of the hoppers that have no excess capacity. In such cases the delay of a few minutes will often stop hoisting. Other hoppers that have larger capacity or hoist a smaller tonnage daily permit much flexibility in schedule.

Transportation costs have been kept within estimates. As much of the material handled grosses as low as $1.50 to $2 per ton it is necessary to keep every item of cost low.

Haulage by trucks has been installed for the benefit of the small mine that occupies an isolated or difficult position



1,200-ton feeder hopper at the head end of the concentrator building

*Eagle-Picher Mining & Smelting Co., Picher, Okla.

Above—Ore train leaving the Southside Mine. Note the hopper of different design at the right.

Left—Ore train loading at the Southside Mine. A train of 350 to 500 tons is loaded in twelve to fifteen minutes.

Right—Typical wooden hopper adapted from one of the abandoned milling plants.

in the rail transportation system, or whose tonnage does not justify the construction of a track and suitable hopper. While this tonnage is erratic in volume it accounts for 6 percent to 10 percent of the total.

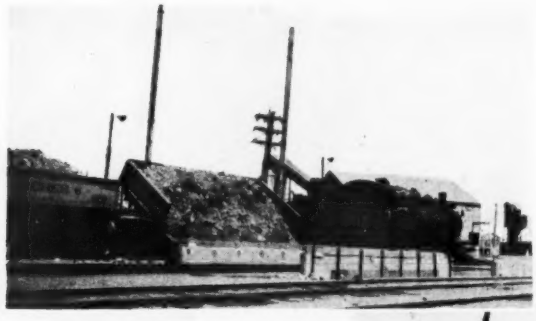
Trucks of various descriptions and sizes are used at times on this haul, but perhaps the most satisfactory are the 10-ton semi-trailers with Chevrolet or similar power plants. The hopper shaped bodies discharge their load through a bottom door held in position by a latch, which is tripped as the truck enters the dump and is closed automatically as the truck proceeds after dumping.

The fifth, or auxiliary primary hopper, of 450 tons capacity, which receives all the truck tonnage at the central mill, also is equipped to receive ore from the bottom dump cars of most any type. This opens the plant to any tonnage originating beyond the scope of the Eagle-Picher operated train, the ore being handled by the railroads in their own cars. It also permits a more flexible operation between the mines and the mill. For instance, in case of a transportation failure caused by Eagle-Picher equipment, a contract with the Frisco permits us to use any of their hopper bottom cars that are available in identically the same manner as the Eagle-Picher cars, except they are dumped through the auxiliary hopper instead of one of the four regular primary hoppers that can receive ore only from the side dump cars. In case of a temporary crippling of mill capacity and the 8,500 tons of hoppers ahead of the mill filled and transportation blocked through no available dumping space, Frisco hopper bottom cars are used for temporary storage to keep the mines operating until the mill is again in operation and on normal schedule. The auxiliary hopper is a big asset to the plant.

The loading of tailings, locally known as "chatt" for railroad ballast, highway and concrete work has grown to sizeable proportions since the fitness and low cost of this product has been demonstrated. Being a waste product from which the mineral content has been extracted, it formerly was a considerable item of expense to dispose of by long conveyors and elevators onto large piles, typical of which a visitor to the district may see by scores. Today at the Central mill with its incoming feed of 5,500 tons daily, practically all the coarse tailing products, comprising 75 percent to 80 percent of the feed, are loaded directly into cars. This makes normally 70 to 80 cars daily which is augmented during the rush season with tailings from the pile, put there during periods of slack demand or car shortage. After milling about 2½ million tons of ore at this plant since October, 1932, a check-up reveals only 200,000 tons in the tailing pile.

But to return to the ore handling phase. Let us follow a lot or unit of ore from its appearance on the surface. The ores containing the zinc and lead minerals are hoisted in cans, typical of the district, into hoppers of 400 to 500 tons capacity that are set high enough to discharge through chutes directly into the cars of the ore train. When a hopper is filled and the train dispatched after its contents the train crew is given a lot card in a suitable carrying case. This card is destined to become a permanent record of that particular lot or train load of ore and contains all information pertaining to it. It carries a serial number, hopper number, mine name, date and hour of dispatching, weighing, crushing, sampling and any other information to make its record complete. At the mine it receives a designating punch mark or property symbol as an assurance that the train has been to that particular mine and not some other one. The lower part of the card is detached and accompanies the sample to the assayers. In the accounting office, all calculations pertaining to this shipment of ore are recorded as will be shown later.

When the train returns to the mill

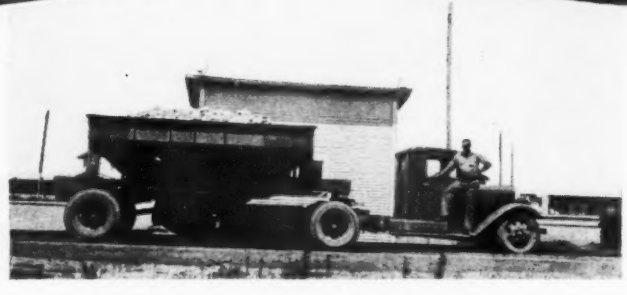


Left—Dumping the first car of a trip into primary hoppers at Central mill. Two a minute is the average rate of dumping.

Below—View of the plant from the west.

Above—In the right foreground just this side of the locomotive, are the four openings into the 500-ton underground hoppers, into which the incoming ore is dumped.

Right—Sixteen tons of ore carried on rubber tires.



with its load of ore this lot card is placed in a Streeter-Amet automatic weighing machine which records the net weight of the ore directly on the card as the train moves slowly over the scales. The train then proceeds onto one of the four tracks, leading to the primary hoppers, which is indicated to the train crew by conventional railway signal lights controlled by the interlocking mechanism.

A detailed explanation of the workings of the interlocking system would be too long and too technical to be of interest here. It will suffice to say that it is operated electro-pneumatically, governing train movements on the four tracks leading to the primary hoppers, actuating the hopper gates in proper sequence and the revolving chute for the proper distribution of the samples and controlling the operation of the sample mill. All these stages are so tied together that any operation affects some other operation elsewhere and a guiding hand must be exercised over the whole. However, the hand is mechanical and cannot make mistakes. The human element is eliminated as far as possible. Checks and cross checks prevail throughout the system and should even a deliberate error be made the mechanism is blocked until it is rectified.

The first sample is taken on a conveyor belt from the primary crushers. The capacity here is around 500 tons per hour and the sampler takes the entire stream for 6 seconds out of every minute, or 10 percent of the tonnage. The remaining 90 percent falls onto a shuttle conveyor which distributes it into a 6,000-ton storage hopper mixed with other lots and its identity lost. But the 10 percent cut represents the whole. It proceeds under the control of the interlocking mechanism until it has been crushed through three more stages and at each stage approximately 10 percent taken out as a sample and 90 percent rejected. Starting with a 500-ton lot the first sample will contain 50 tons, the second cut reduces that to 5 tons and the third to ½ ton and the fourth to about 100 pounds. Bear in mind that the size of the particles are reduced ahead of each sampler. The sample cutters are entirely mechanical and take the entire stream of ore on every cut. They are operated by air cylinders actuated by electro-pneumatic valves which are energized through telchron clocks. Indicator lights in front of the operator immediately announce any deviation from the normal.

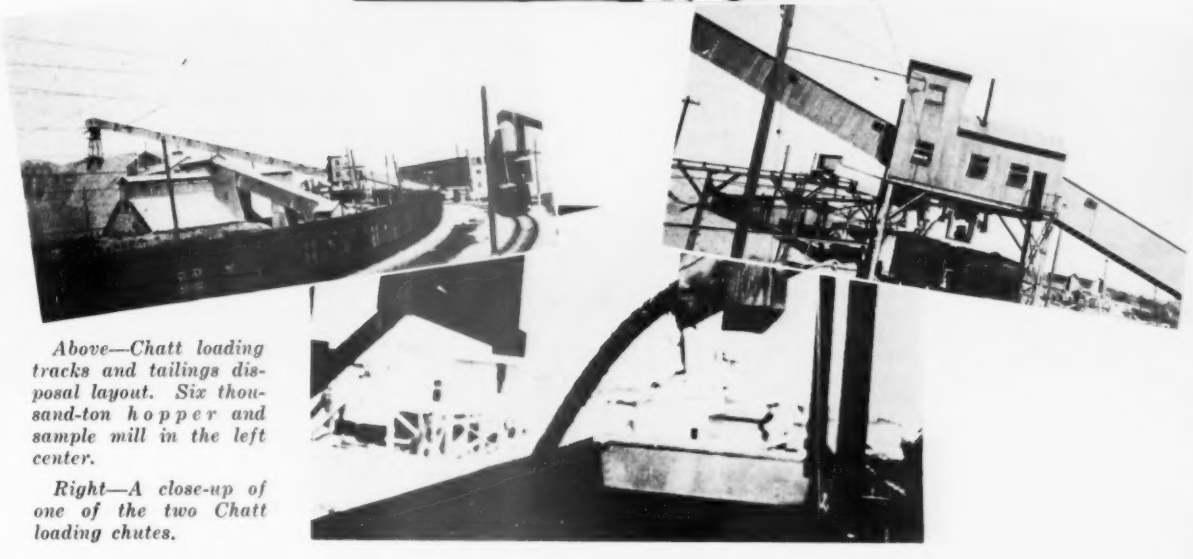
After the final stage of mechanical sampling, representatives of two commercial assayers take the sample, reduce and cut it further on laboratory equipment and run independent moisture, zinc and lead content determinations. A third sample is filed away as a precautionary measure to be used in case the assayer's results do not check within the permissible limits and an umpire or check assay is necessary. Company employes at no point handle the sample; the operation is entirely mechanical while under their control. The assayers know their samples by number only, never by origin or ownership, and that number is the serial number of the lot card. The detached portion of the card goes to the sample mill and is placed in the sample container in its journey to the assay laboratories. A check on the number, which is serial, is flashed to the sample mill by an electric counter operated through the interlocking mechanism. Assay sheets are attached to the card in the accounting office to become a part of the permanent record.

On the reverse side of the card is a form to aid in the solution of the theoretical quantities of zinc and lead concentrates produced from this particular lot. Briefly the problem may be set up in algebraic form as follows:

Let Z=Zinc concentrates in pounds.
L=Lead concentrates in pounds.
T=Tailings in pounds.
H=Mill feed in pounds.
Then Z+L+T=H (Equation 1).

Left—A corner showing a part of the automatic weighing machine at the left and the selector of the interlocking mechanism in the cabinet.

Below—Chatt loading tower.



Above—Chatt loading tracks and tailings disposal layout. Six thousand-ton hopper and sample mill in the left center.

Right—A close-up of one of the two Chatt loading chutes.

Let a=assay of zinc in zinc concentrates.
b=assay of zinc in lead concentrates.
c=assay of zinc in tailings.
d=assay of zinc in mill feed.

Then $aZ+bL+cT=dH$ (Equation 2).

Let V=assay of lead in zinc concentrates.
W=assay of lead in lead concentrates.
X=assay of lead in tailings.
Y=assay of lead in mill feed.

Then $VZ+WL+XT=YH$ (Equation 3).

Solving equations 1, 2, and 3 for three unknowns, Z, L, and T, we have:

$$Z=\frac{(d-c)W-(d-b)X-(b-c)Y}{(a-c)W-(b-c)V-(a-b)X}H$$

$$L=\frac{(a-c)Y-(d-c)V-(a-X)X}{(a-c)W-(b-c)V-(a-b)X}H$$

$$T=\frac{(a-b)V+(a-d)W-(a-b)Y}{(a-c)W-(b-c)Y-(a+b)X}H$$

As these formulae do not lend themselves readily to rapid calculation it was desirable to devise some simplified method of solution that could be installed in an accounting office. The "window" or aperture card was worked out by Messrs. Gow and Coghill, of the Bureau of Mines Experiment Station, at Rolla, Mo., and is being used satisfactorily. As will be noted from the formulae, four columns of apertures are needed, one each for Z, L, and T, and one for the common denominator. By moving the aperture card so the letters correspond with the letters on the lot card and doing the arithmetical computations indicated, the theoretical quantities of zinc and lead concentrates are ascertained. These figures are carried down on the card with the values to complete the history of the lot.

One source of loss not accounted for in the foregoing is thickener losses. This is kept in terms of mill feed, as a separate calculation, obtained by using the quantity of water going to the thickeners, the rate of mill feed and quantity and assay values of solids as shown by periodic samples. These results added to the assay values of the direct tailings approach very closely the overall tailing loss.

The mineral production of the United States in 1934—including metals, nonmetals, and fuels—was valued at $3,350,000,000, an increase of 31 percent from $2,555,100,000 in 1933. This advance in total value reflected not only increased output but also higher unit prices which resulted in part from provisions of codes of fair competition under which virtually all branches of the mineral industry were operating to some extent during 1934. Production of practically all major mineral commodities increased in 1934; outstanding examples were coal, gold, silver, natural gas, cement, and crushed stone. Prices likewise increased, especially for silver, gold, pig iron, copper, petroleum, bituminous coal, and cement. The value of mineral production in 1933 and 1934 is summarized by principal groups in the following table:

	1933	1934	Increase from 1933, percent
Metals	$411,300,000	$542,100,000	31.8
Nonmetals (except fuels)	449,350,000	534,600,000	19.0
Mineral fuels	1,683,550,000	2,258,700,000	34.2
Unspecified	10,900,000	14,600,000	...
Total minerals	$2,555,100,000	$3,350,000,000	31.1

Requisites for Mechanical

Conveyor Loading

By GEORGE E. BAYLES*

THE object in coal mining is to produce the greatest quantity of coal, in the shortest time, from a given property, at the least cost, with a minimum of danger to or loss of life or property, and upon which production a maximum market realization may be made. The continued operation of any coal mine, as well as the profit resulting from the operation, depends entirely upon the degree of success in attaining this objective. This means for all domestic and commercial coal mines, that the least cost, maximum tonnage and maximum market realization, will be, in a great measure, governed by the size analysis and the amount of extraneous foreign material in the coal produced under any mode of operation.

Given a coal which can be marketed, the factors which will affect the choice of hand loading or mechanical loading, and if mechanical loading be chosen, the further selection of the larger types of loading machines or conveyors, and the types of conveyors to be used, as well as the system of mining to be employed are as follows:

Roof characteristics.
Depth of cover or overburden.
Thickness of seam.
Physical character of the coal in place.
Character of the coal after being broken down.
Pitches of the seam, or grades.
Presence of water or gas.
Nature of the seam bottom.

In locations where the thickness of the seam, or steep pitches preclude the use of the larger types of loading machines and prohibit the use of mobile loading units, the conveyor is naturally the mining unit selected. There is such a variety of types and designs of conveyors, if conveyors can be used at all, that one type may be found which will successfully cope with all the conditions imposed. By using one type of conveyor for one kind of operation, and another type for a different operation, the ultimate of a completely conveyor-equipped mine may be reached, if economics and natural conditions make it advisable.

There are many factors which affect the selection of conveyors as the means of performing an operation or group of operations in mining a body or area of coal. Conveyors afford a reduction in the amount of labor involved in loading coal after it has been broken down, with the practical elimination of gathering haulage, as required in hand mining. In low seams, they greatly reduce the amount of rock brushing required for routine mine operation. Under bad or unfavorable roof conditions, they permit much closer timbering, and in areas of soft wet bottom are much better supported and maintained than is track with the shock and pounding of passing trips of cars. Common with other mechanical loading systems, conveyors permit a greater concentration of mining.

It is reasonable to assume, and the assumption is borne out by the experience of those companies using conveyors and conveyor mining methods, that the accident hazard is reduced. Mechanical conveyor loading requires a greater number of more intelligent and skillful men to operate the machines and closer supervision is demanded by the concentration of workings and the rapid rate of extraction compared to hand mining. There is also much less open face area exposed, per unit of production, with the consequent decrease of total gas liberation and the improvement of face ventilation. Drainage becomes a simpler job, and since gathering pumps may be kept closer to the faces, greater advantage may be made of them. Power distribution is also simplified with a consequent increase in efficiency.

Opposed to these favorable factors, are others bearing equal importance. The adoption of any mechanical loading system involves quite an extensive capital outlay for underground equipment, not required in hand mining, and a great expansion of existing surface preparation plants or the erection of complete plants if such are not in existence, even in some cases, to the installation of very large and complete washeries.

The advent of mechanical loading is almost invariably accompanied by an increase in the amount of extraneous foreign material in the coal, and also a decrease in the proportion of the coarser sizes of coal, from that obtained by hand loading. With the domestic and commercial mines, these two adverse features affect both the production cost and the market realization to such an extent that, with some mines, the spread between mining cost and sales price, which has never been very large, decreases almost to the vanishing point. Enough of a saving in production cost must be made to pay the loss in market realization, due to size, as well as the greater preparation expense.

In a great many cases, the advent of mechanical loading into a mine, has caused a complete revamping of the system of mining to be made and results in varying degrees of success. Adaptation of the machine to the existing operating system, which has been proven successful in its particular field, generally results in the most successful mechanical loading operation. The type of equipment used, and the manner of its use, is controlled by the natural mine conditions and cannot be made superior to them. The machine must be made to fit the mine, and not the mine to fit the machine. A mechanized operation using certain types of machines with a certain cycle of operations, may be an outstanding success in one locality, or a coal field, and may be a total failure somewhere else, even when employed by men of equal or greater mining skill. While there is always room for improvement in any operation or process, it must be remembered that our present systems of mining in use in the various coal fields are the results of many years of coping with a variety of underground problems, among which roof control and support have been highly important factors, as well as the action of the pressure of the overburden upon the coal left by first mining, to be recovered by later operations.

In many fields, for those reasons, expected advantages in machine or conveyor loading have not been gained. Also for those same reasons, the liability of loss of, or damage to, machines and material is too serious a matter to permit a large concentration of costly machines and mechanical units in portions of mines where conditions were otherwise favorable for their use. Such portions

* Chief Engineer, The Ohio & Pennsylvania Coal Co.

of a mine must then be worked out by hand, at generally higher than ordinary hand mining cost, or else abandoned, with resultant capital loss.

The system of mining must also be designed so that the tonnage produced will meet the demands of its market. This fact will determine whether mining must be done advancing or retreating; whether wide rooms and faces shall be driven where roof and bottom permit wide work; and whether complete or partial extraction of the ribs may be made. It must here be noted that for almost any of the past or present systems of mining coal, a type of conveyor or combination of types of conveyors may be found which will fit into the fundamental mine lay-out. They may be effectively, and most generally have been, used as intermediate transportation units from face to car haulage where other conditions prohibit mechanical loading at the face.

Some special conditions under which conveyor mining applications have proved successful are:

1. To mine a relatively clean seam of coal of good quality, having a good roof and floor, but in which the total working height is less than 48 in.

2. To gain speed in the driving of development entries, especially where cost, though important, is a secondary consideration.

3. To mine a seam of coal, the thickness of which is subject to fairly wide variations over the property. Because of the ability of conveyors to operate in the low areas as well as in the high ones, uniformity of the workings is gained, with resulting improvement in roof control and the percent extraction, especially where ribs are drawn.

4. Mining a seam of coal having a very bad roof which requires close timbering. The use of conveyors in such an application reduces the necessity for heavy permanent timbering to that required on the haulways and aircourses having a long life. The safety of the workmen is increased since timbers may be set closer than allowable where cars are spotted at the working faces.

5. Mining coal where pitches and grades are too great for the safe and economical use of locomotives and cars.

6. Mining under long face or modified long wall systems.

Many operations which have been mining undesirable top and bottom benches of a coal seam, in order to gain sufficient height for hand mining or to permit the use of the larger loading machines, have found the installation of conveyors to be their salvation, because they eliminated the necessity of handling this worthless material in all places except motor haulways. Relief from handling this waste also relieves the need for as much gob room in the working places themselves; a single factor which may permit a change to a more desirable mining system, with a view towards better roof control, and increased safety and production. The quality of the coal produced in such a case is greatly improved, contrary to the general experience with mechanical loading, through the sure contamination by fines and small sizes of this foreign material becoming mixed with the coal to be loaded.

A property, over which there are large areas of thin coal, in which mining of the thick areas has proceeded for some time and on which the total capital expenditure has been made and largely recovered, is ideal for conveyor mining; the only capital outlay, in such a case, is for the conveyors themselves, as all the other needed equipment is already on the job, and the coal areas to be worked are areas which have been, for the most part, written off as unmineable. This type of operation may, and frequently does, lead to the extraction of the remaining areas of high coal on the property by conveyor methods. Conveyor mining used in this way becomes an adjunct to hand mining, which it may supercede.

The majority of conveyor installations have been in the types of operations as mentioned, and the types of conditions themselves, except in cases of superquality coals, or unusual markets, would seem to indicate that they were not fully known at the time of opening the mines. It they were, a lot of mines "forced to go to conveyors" would not have been opened in the first place.

In view of all the foregoing, as an installation to mine out a property from the surface to final extraction, the adoption of conveyor mining seems questionable. Other systems, in higher coal, are just as efficient in operation and require less initial capital expenditure. Except for a few special cases, there is not at present economic justification for opening a new mine in thin or multiple split seams.

EXPANDED activity at steel mills, the chief consumer of fluorspar, coupled with an increase in the average quantity of fluorspar used per ton of steel made, resulted in a consumption of about 20,600 tons more fluorspar by the steel industry in 1934 than in 1933. However, this increased consumption was not accompanied by a corresponding improvement in the sales of fluorspar, which were only about 9,600 tons more than in 1933, due to withdrawals from consumers' stocks which dropped from 56,900 tons in 1933 to 46,300 tons in 1934. Manufacturers of hydrofluoric acid, second in importance as a consumer of fluorspar, purchased about 5,700 tons more fluorspar in 1934 than in 1933. Makers of glass, the third largest user of fluorspar, purchased about 500 tons more fluorspar than in 1933, while manufacturers of enamel, the fourth largest consumer of fluorspar, purchased about 900 tons less.

The total sales of fluorspar to consumers in the United States in 1934 were 101,662 short tons, of which 85,264 tons were from domestic mines and 16,398 tons were imported, compared with 85,265 tons in 1933, of which 72,859 tons were from domestic mines and 12,406 tons were imported. The demand for domestic fluorspar in both years required only a small part of the potential productive capacity of mines and mills, the Illinois-Kentucky district alone having a rated annual capacity of 230,000 tons.

Expansion of the operating rate at steel plants from about 33 percent of capacity in January, 1934, to 56 percent in May, 1934, was accompanied by an increase in the price of domestic fluxing-gravel fluorspar, which opened in January at $15 a short ton f.o.b. Illinois-Kentucky mines and by April had advanced to $17. However, the sudden drop to 27 percent of capacity at steel mills in July, 1934, caused the price of Illinois-Kentucky fluorspar to weaken and it was reduced to $15 a ton. Imported fluxing-gravel fluorspar at tidewater (duty paid) was quoted during January and February, 1934, at $18.50 a short ton, but during the latter part of March it was advanced to $19, the quoted price the remainder of 1934. Domestic ground fluorspar in bulk opened in January, 1934, at about $30 a short ton f.o.b. Illinois-Kentucky mines, was increased to about $35 in February, and fluctuated between $27 and $32 during the remainder of 1934.

United States

Production.—In 1934 fluorspar was produced at 91 mines or prospects (and at an undetermined number of storage yards, mill ponds, and waste dumps) which yielded the equivalent of about 87,000 short tons of merchantable fluorspar. In 1933, 66 mines or prospects were worked, yielding about 59,000 tons of merchantable fluorspar.

Shipments.—Shipments of fluorspar from domestic mines aggregated 85,786 short tons valued at 1,391,405 in 1934, an increase of 18 percent in quantity and 34 percent in total value compared with 1933, but only 69 percent of the average annual shipments for the five-year period, 1926 to 1930. Of the total shipments in 1934, 23,302 short tons were shipped from the Illinois-Kentucky district by barge for delivery at upper Ohio River landings, compared with 19,797 tons in 1933. The general average value for all grades was $16.22 a ton in 1934, $1.97 more than the 1933 average. The general average value per ton of the fluorspar shipped to steel plants from the Illinois-Kentucky district was $15.28 in 1934, compared with $12.83 in 1933.

Stocks at mines.—The stocks of fluorspar at mines or at shipping points on December 31, 1934, consisted of 46,059 short tons of gravel fluorspar, 4,111 tons of lump fluorspar, and 416 tons of ground fluorspar, a total of 50,586 tons of "ready-to-ship" fluorspar. In addition, there was in stock piles at the close of 1934 about 33,300 tons of crude (run-of-mine) fluorspar, which is calculated to be equivalent to about 14,600 tons of merchantable fluorspar. These stocks compare with 44,777 tons of "ready-to-ship" fluorspar and 42,000 tons of crude fluorspar on December 31, 1933.

(*Concluded on page* 73)

LONG ROPE HAULAGE

in Western Kentucky

By DAVIS READ*

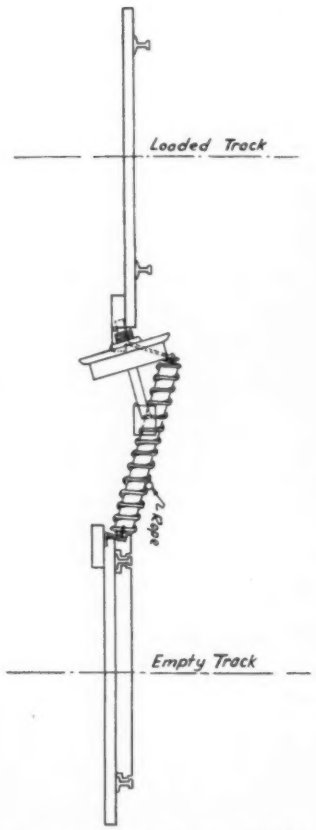
IN this section of Western Kentucky the coal beds lie on a fairly uniform slope of about 6.5 percent, dipping to the north. Along the southern boundary of the field the coal is close enough to the surface to be worked from a slope opening. In some locations shafts have been sunk at a distance north of the crops sufficient to provide territory to be worked upgrade from the shaft, thus allowing the coal hauled downgrade by locomotives instead of upgrade by rope haulage as is done in the slope openings. This method would seem more economical at first observation, but in actual practice the locomotive haulage on the 6.5 percent grade is not so satisfactory even though the grade is in favor of the loads. Frequently the locomotives are unable to hold back the trips and costly wrecks occur. Also the efficiency of the locomotives hauling the empties up the grade is very low, compared to that of rope haulage under the average conditions.

The rope haulage, of course, is not as flexible as the locomotive but with a uniform pitching seam in which a slope entry can be driven straight so that no horizontal sheaves or turns are necessary the rope haulage is much more efficient.

Probably the longest rope haulage in this section is about 9,000 ft. on a 6.5 percent average grade with a maximum grade of 10 percent for a distance of 400 ft. starting 2,000 ft. down the slope.

This slope has been driven perfectly straight horizontally and therefore there are no complications caused by horizontal sheaves or vertical rollers to turn the rope except the main horizontal sheave near the hoist and the small horizontal sheaves leading into the side tracks at the mouth of the cross entries from which the cars are gathered to the rope haulage.

As the main slope haulage increased in length from year to year it became apparent that the equipment would have to be improved if the tonnage of the mine was to be maintained. Larger cars were installed with heavier wheels and roller bearings to withstand the higher speed which called for heavier and better track. The improvement of the track offered no unusual problem, the light steel being replaced by heavier on larger ties and better road bed.



Rope shifter used at switches

The speed of the loaded trips was increased to about 1,300 ft. per minute so the empty trips could be lowered at a somewhat slower rate which would prevent wrecks that occurred more frequently with the empties than the loads. With the increased speed of the loaded cars it was found necessary to maintain the wheels and bearings in first class shape as "flat" or loose wheels soon went to pieces.

As the length and size of the rope were increased from time to time the cost of this item became more and more an important factor in the economical operation of the mine. This factor has naturally been the subject of considerable study and attention by the operators.

The principal operating factors of this haulage are as follows:

Length of slope, 9,000 ft.
Horizontal alignment of slope is straight.
Average grade of slope, 6.5%.
Maximum grade 2,000 ft. from mouth, 10%.
Head sheave is 5 ft. and rotates in horizontal plane.
Drive diameter, 60 in.
Drum width, 96 in.
One trip 22 loaded cars; total weight, 198,000 lbs. = 99 tons.
Total rope stress for 10% maximum grade, including weight of rope and friction = 22,510 lbs.
Rope being used, 1⅛-in. diameter 6 x 7.
Breaking strength, 87,200 lbs. $= \frac{87,200}{22,510}$ = 3.9 safety factor.
Average speed of loaded trip, 1,300 ft. per minute.
For the 6.5% average grade for length of 9,000 ft.
Weight of rope 9,000 x 1.9 = 17,100.

Gravity stress for 6.5% = .0639 x 198,000	12,652
Gravity stress for average grade 6.5% = .0639 x 17,100	1,092
Rope friction 8.55 tons x 100	855
Car friction 99 x 25	2,475
Total rope stress at maximum length	17,074

Gravity stress and friction due to loaded cars alone = 15,127.
Gravity stress and friction due to rope alone (when rope is at maximum length) = 1,947.
$\frac{1.947}{15,127}$ = 12.8%, which is the percentage loss due to the rope at maximum length.

From the above calculations the total average rope stress is 16,101 lbs. for a length of 9,000 feet of 6.5 percent grade, which is equivalent to raising 126 tons a vertical distance of 575 ft. for each trip hauled.

As the cost of the last ropes used has been about $3,000, and their life is about 14 months, it is readily seen that any marked improvement in operating conditions would evidently result in considerable saving.

The most important factors causing damage and wear to the rope are generally as follows:

Improper winding of the rope on drum.

* West Kentucky Coal Co.

Damage caused by insufficient rollers or improper functioning of rollers. Insufficient oiling or protective treatment.

Probably the most damage done to the ropes after the larger equipment was installed was caused by improper winding of the rope on the drum causing severe shocks to the rope and drum when the rope snapped into gaps left between the wraps. These severe strains finally cracked the drum which was replaced by a much heavier one. This improper winding continued on the new drum and it was finally decided, after considerable study, that excessive vibration in the rope was causing the poor winding. This vibration was caused by high rope speed, chatter of the wood rollers in the slope, and vibration of the drum shaft. This latter factor was due to overloading of the hoist when the larger cars were installed and finally resulted in the installation of a larger hoist, with 12-in. diameter drum shaft, and driven by a pair to 24-in. by 36-in. first motion engines.

Since the installation of this hoist there has been little vibration in the rope and consequently little trouble in the winding.

Oil or other protective treatment is very necessary to rope maintenance and has been applied daily regardless of whether the mine is operating or not. The usual method of allowing the rope to pass slowly through a trough containing the preparation is used.

By far the most expensive troublesome factor in operation and maintenance of the rope and haulage road has been that of the rollers used to keep the rope from dragging. The dragging of the rope over ties and over the rails or turnouts causes rapid deterioration and wear of the strands and determines to a greater extent than any other factor the life of the rope.

The problem of finding a satisfactory roller at a cost that would not be prohibitive or of finding some other way of eliminating the wear due to friction has not been satisfactorily solved to date. There are 600 rollers distributed over the 9,000 feet of slope which requires constant attention. Steel rollers of several different types have been tried but have not given satisfactory service sufficiently to warrant the increased cost over wood rollers which have been generally used. Ball and roller bearing rollers have been tried in special locations over knuckles and have given good results but their cost is prohibitive in the place of the ordinary rollers.

We are at present installing some steel rollers with a heavy rubber lagging about 1 in. thick. This is designed to afford ample friction to the rope when the empty trip is being lowered. When the trip is being lowered the rope runs slack over the idlers without enough pressure or friction to cause the ordinary rollers to turn in some cases. This causes some wear on the rope and frequently causes the surface of the roller to wear. The cost of this type of roller, like the other roller-bearing steel rollers, will no doubt be a prohibitive factor.

The wood rollers are about 6 in. in diameter by 16 in. long and are made of local timber, gum, maple, or sycamore, at a very small cost, around 25 cents each. The iron pins which extend through the rollers as spindles are taken from the worn-out rollers and used in the new, so the only expense is the wood and labor turning down and installing.

The chief objection to the steel rollers is the damage done to the rope when one happens to get "frozen" or jammed. When a wooden roller fails to turn, it is usually ruined by the rope cutting a deep groove into it, but there is little damage done to the rope. With the wooden rollers it is necessary to renew about 100 rollers each month during the busy season, and this and miscellaneous track maintenance require two men during all operating days. The maintenance of the rollers is increased materially by the damage caused by the derailer which is attached to the last car of the trip to prevent a runaway in case of a broken rope or coupling.

The derailer or safety dog that is now

being used is the simplest type of all those tried and seems to be the only type that survives under continuous service. This is nothing more than a car axle about 4 ft. long, sharpened at one end and coupled to the regular pin at the other. The sharp end drags along on the track and digs in when the trip starts back, throwing the rear car off the track.

The problem has been to devise a safety dog that would stay up off the track while the trip was being pulled out but would drop down and engage when the trip started back. This would prevent the rollers being broken or torn loose by the rebound and swing of the safety dog. Frequent wrecking of the empty trip is caused by these rollers being torn loose during the loaded trip and fouling the bumpers of the empty cars on their return. These tripping devices which cause the safety dog to drag down when the trip starts back require stationary trippers at points along the track where the safety dog is assumed to engage and have not proven very satisfactory.

At present, consideration is being given to whether it would be more economical in the long run to eliminate the safety dog entirely and take a chance on the trip breaking loose and wrecking. Considering the delay and damage caused by minor derailment of empty cars caused by rollers being torn out and the cost of replacing such rollers over a long period, the loss would probably be less if the derailer were eliminated.

The most frequent cause of wrecks is the failure of the couplings which are of the three-link type. As seen by the haulage calculations, the total rope stress is 22,510 lbs. normal, which could easily be doubled due to shocks, the couplings are subjected to severe strain and have frequently failed. This has been overcome almost entirely by annealing the links at regular intervals. The three-link couplings are seldom used with modern cars and locomotive haulage, but due to the vibration caused by the high speed of the trip, with a single-link coupling, the pins very often work entirely out of the bumper, but with the three-links there is enough flexibility to prevent this.

Following is a record of the life of the successive ropes for the past seven years and the tonnage:

Diameter of rope	Date installed	Tonnage pulled
1-in.....	11/13/1927	273,282
1-in.....	11/13/1928	273,434
1-in.....	11/24/1929	253,257
1-in.....	11/22/1930	269,993
1-in.....	3/27/1932	135,952
1-in.....	11/15/1932	365,884
1⅛-in.....	6/ 9/1934	

It will be observed that the next to the last rope installed pulled the most tonnage by a wide margin. This was due to increased maintenance of the rollers and better treatment in general. The rope that is on at present is a 1⅛-in. instead of 1-in. diameter as previously used, and has been installed since the larger hoist was installed and should pull a larger tonnage than the previous one, since the trouble due to improper winding has been eliminated.

A different procedure has also been adopted to equalize the wear on this rope from that used on the previous ones. When the trip end of the rope became worn, the rope was turned end for end, which placed the worn end on the drum. With the rope now on, it is planned to cut off about 2,000 ft. of the trip end and splice this much new rope on the drum end. This will afford better winding on the drum than would the worn end and would give greater strength close to the drum to absorb the greater stress due to acceleration of the trip and rope when at maximum length.

Edward J. Burnell, general sales manager of Link-Belt Company's central division, with headquarters in Chicago, recently sailed for Europe, where he will investigate coal handling, washing and preparation methods employed in England, Germany, and Belgium. As Link-Belt equipment for the preparation of coal at the mine forms a specialty of the company's Chicago plant, its exploitation falls under Mr. Burnell's direct supervision. The Simon-Carves coal washing system was introduced into America by Link-Belt some years ago. It is said that 32 of these washing units, with latest improvements, have since been built in Chicago and installed throughout United States coal fields.

PERSONALS

Lucien Eaton, consulting mining engineer, has returned to the United States after an extended professional trip which took him around the world.

A. G. Mackenzie, A. W. Hahn and **C. T. Van Winkle** have been appointed as members of the Utah State Copper Tariff Board.

Scott Turner has opened an office at 420 Lexington Avenue, New York City.

Walter M. Dake, Joy Machine Company, has been seriously ill at the New York Post Graduate Hospital.

Charles Will Wright, who has recently been appointed Foreign Mineral Specialist of the United States Bureau of Mines, sailed on July 31 for the principal European countries, where he will study national mineral policies and the results of production control.

J. C. Kinnear, general manager of the Nevada Consolidated Copper Corporation, has returned from a trip to Mexico. He recently announced that his company was operating on a 20-day-per-month basis and has issued a wage increase of 5 percent.

B. C. Yates, Homestake Mining Company, recently announced a $50 bonus to each of the employes of the company.

Edward L. Sweeney, of Denver, has completed the 300-ton flotation plant for the Como Mines Company of Nevada.

Harvard University recently awarded an honorary degree of Doctor of Science to **Waldemar Lindgren.**

Charles F. Huber, chairman of the board of the Glen Alden Coal Company, has resigned to accept the presidency of the Anthracite Institute.

Frank M. Smith and **Eugene A. White** have beeen appointed members of the Copper Tariff Board for the State of Washington.

E. T. Stannard, president of the Kennecott Copper Corp., has been elected president of the reorganized United States Copper Association. **L. S. Cates** and **C. F. Kelly** have been elected vice presidents of this organization.

Announcement has been received that **J. H. Brown**, formerly Eastern sales manager of Sullivan Machinery Company, has joined Worthington Pump and Machinery Corporation as regional manager of its mining and construction division, covering the Mid-western territory, with headquarters in Chicago.

Louis C. Madeira, III, executive director of the Anthracite Institute, was away from his office for the month of August on vacation.

The Regents of Education of South Dakota have appointed **Dr. Joseph P. Connolly** as president of the South Dakota State School of Mines, to succeed the late **Dr. C. C. O'Harra.** Dr. Connolly has been professor of mineralogy, petrography, and economic geology at the School of Mines since 1919, and vice president since 1926. The appointment as president is effective August 1.

Announcement of the appointment of **Oliver C. Ralston**, of Clarkdale, Ariz., as supervising chemical engineer, of the Nonmetallic Minerals Experiment Station of the Bureau of Mines, Department of the Interior, at New Brunswick, N. J., is made by Dr. John W. Finch, director of the Bureau of Mines. **Mr. Ralston** succeeds **Dr. Everett P. Partridge**, who resigned to enter private employment.

Alexander L. Field, consulting engineer for the Rustless Iron Corporation of America and president of the Alloy Research Corporation, has been appointed professor of metallurgy at the Carnegie Institute of Technology. He will assume his new duties in September.

James D. Francis, president, Island Creek Coal Company, has returned to the United States after a vacation in Bermuda.

W. J. Jenkins, president of the Consolidated Coal Company of St. Louis, has returned to his home after an extended vacation in California.

Bart Gebhart, assistant to the president of Appalachian Coals, Inc., has returned to Cincinnati after a two weeks' vacation trip to Wisconsin.

James F. Callbreath, secretary emeritus of the American Mining Congress, has returned to Washington after spending the summer at his ranch at Alamosa, Colo.

Julian D. Conover, secretary of the American Mining Congress, is visiting some of the principal mining camps of the West in the interest of the annual meeting of that organization to be held in Chicago in September.

H. O. King, former managing director of the Copper Code, has announced the formation of the H. O. King Company, which will deal in copper, lead and zinc, and will handle accounts for various producers.

The staff of the Cleveland-Cliffs Iron Company was deeply shocked by the sudden death of **Charles G. Herr**, treasurer, due to a heart attack.

B. W. Traylor, prominent crushing and mining engineer, and district manager of the Southern sales office of the Traylor Engineering & Manufacturing Company, Allentown, Pa., died of a heart attack, at Louisville, Ky., on August 14, 1935; aged 64.

Born in Texas, a member of one of the pioneer families of the Lone Star State, Mr. Traylor brought to the Traylor Engineering & Manufacturing Company, upon its incorporation, a wealth of experience as a designer, builder and operator of metallurgical plants, which was a valuable aid to the company which he served successively as superintendent, general manager, vice president, and district sales manager.

George W. Lambourne, president and general manager of the Park-Utah Consolidated Mines Company and affiliated companies, died after a short illness at Los Angeles, August 2, 1935.

Mr. Lambourne was a conspicuous figure in mining and financial affairs in Utah for a generation. He entered the industry in a humble capacity when a young man, but early demonstrated his abilities as an executive and organizer and at the time of his death was recognized as one of the foremost metal mine operators of the region. The mining companies under his direction have paid a total of more than $37,000,000 in dividends.

Mr. Lambourne was a man of quiet tastes who never sought public life. He was, however, extremely active in the mining organizations. He served continuously as a director of the Utah Chapter, American Mining Congress, from the time of its organization in 1915 until his death and was governor of the chapter from March 8, 1920, to March 13, 1922. He was also a director of the Lead Industries Association, member of the American Zinc Institute and a member of the American Institute of Mining and Metallurgical Engineers.

For many years past he had been a frequent visitor to many parts of the United States and Europe, and was exceptionally well-informed on national and international affairs, as well as local. He was highly esteemed in all circles where he was known.

Mr. Lambourne was born at Salt Lake City in 1867, a son of pioneer parents, and made his home there throughout his life. His widow, two granddaughters and a grandson survive him.

MINING EVENTS

THE Bunker Hill and Sullivan Mining and Concentrating Company has distributed in dividends $48,621,322.78, covering a period of from 1886 to 1934 inclusive. This property was discovered in 1885 and the fiftieth anniversary is to be celebrated by a pageant.

THE Phelps Dodge Corporation is improving its copper smelter at Douglas and will spend $250,000.00 on its modernization program.

ALABAMA Coals, Inc., has been organized. Herbert S. Salmon is president of the agency and N. E. Cross is secretary. Both of these gentlemen were connected with the Code Authority under NRA. The directors of the agency are: W. C. Adams, Porter Coal Company; C. S. Bissell, Black Diamond Coal Mining Co.; R. T. Daniel, Cane Creek Mining Company; C. S. DeBardeleben, Alabama Fuel and Iron Company; P. H. Haskell, Alabama By-Products Corp.; A. R. Long, Brookside Pratt Mining Company; Geo. F. Peter, Southern Coal and Coke Company; David Roberts, Brilliant Coal Company; B. F. Roden, Roden Coal Company; and D. A. Thomas, Montevallo Coal Mining Co.

THE Union Pacific Coal Co., Eugene McAuliffe, president, on June 26 staged their eleventh annual reunion of the Old Timers' Association. The festivities were marked by the customary parade and the annual banquet. Mr. McAuliffe and Chief Justice Ralph Kimball of the Wyoming Supreme Court, each made an address. Field day events included a demonstration by the first-aid teams. The team from Superior took first place with 408½ points out of a possible 500. Winton No. 1 won second place and Hanna No. 2, third place. a Holmes certificate of honor were awarded to the Superior C Mine for operating from October 21, 1933, to December 31, 1934, without a lost-time accident. Rock Springs No. 4 Mine received a Holmes certificate for operating from April 17, 1923, to December 31, 1934, without a fatality and certificates were awarded all of the company's Wyoming mines for reducing fatalities per million of tons of production from 4.94 in 1923 to 1.25 in 1934 and for reducing deaths per thousand men employed from 5.27 to 1.68 in the same period. Union Pacific properties have long maintained an enviable record in their safety work.

NINE miners were killed July 17 in an explosion at Mine No. 5 of the Consolidation Coal Company at Van Lear, Ky. Shortly after the disaster the United Mine Workers swore out a warrant for the arrest of John F. Daniel, chief of the State Department of Mines, on the charge that he failed to enforce the state safety laws. They alleged that these laws require five fire bosses to inspect the workings and that the mine maintained but one. Mr. Daniel stated that the company had completely complied with all safety laws.

THE West Virginia Coal Mining Institute safety meet was held August 10. This was their fourth annual meeting with some 8,000 persons in attendance. The Consolidation Coal Company's team from Mine No. 32 won the meet with a score of 100 percent plus. Reppert Coal Company's Rosemont team was awarded second prize with a score of 100 percent minus. The third prize was won by the Davis Coal and Coke Company's team from their mine at Thomas, W. Va., with a score of 99.81 percent. Fourth place was won by the Galloway Mine of the Simpson Creek Collieries Company with a score of 99.80 percent. The meet was directed by L. S. McGee. J. J. Forbes of the Pittsburgh headquarters of the Bureau of Mines and Geo. W. Groves were judges.

LISTEN, MY CHILDREN, AND YE SHALL HEAR!

—Washington Daily News

R. E. W. HARRISON, chief, Machinery Division, U. S. Department of Commerce, has resigned, effective September 30, to resume consultant practice to the metal working industries. Mr. Harrison will be associated with Eugene C. Clarke, with offices located at 1818 Packard Building, Philadelphia, Pa. He will act as technical consultant for such concerns as the Chambersburg Engineering Company, manufacturers of metal working and forging equipment, and the Cochrane Corporation in the development of their line of steam specialties.

THE forty-second annual fall meeting and election of officers of the Illinois Mining Institute will be held Friday, November 8, 1935, at the Hotel Abraham Lincoln at Springfield, Ill. The program committee is now working out details for the morning and afternoon business sessions as well as plans for the dinner in the evening.

FOR many years all of the western mining states except California and Utah have required certain "location" or "discovery" work when taking up a claim. This requirement greatly curtails the indiscriminate location and holding of numerous claims for speculative purposes and tends to prevent jumping of claims due to lack of proper monumenting. Walter W. Bradley, state mineralogist of the Department of Natural Resources, announces that a new California statute, patterned after those of Nevada and Arizona, has just been signed by Governor Frank F. Merriam and will become effective on September 14, 1935.

This act, introduced in the legislature by Senator Andrew Pierovich of Amador County, and known as S. B. 529, provides that within 60 days after location each corner and the center of each end line shall be marked by a post not less than 4 inches in diameter or a stone monument not less than 18 inches high. Within 90 days a shaft 10 ft. deep must be sunk or an adit or open cut made exposing the deposit 10 ft. below the surafce.

On placer locations of more than 20 acres the locator within 90 days must perform $1 worth of development work for each acre in the claim.

The "location work" must be done on relocations of old claims by doing new work or deepening the old workings.

CONDITIONS in the domestic crude barite industry in 1934 were encouraging, according to the U. S. Bureau of Mines. The upturn in mine production and sales which began in 1933 extended through 1934. Prices quoted by one trade journal remained at the same levels throughout the year. Sales realizations on actual shipments by producers, however, showed some variation. Total stocks at mines, plants, or shipping points on December 31, 1934, were substantially reduced, due in part to a general improvement in demand. Increased purchases of domestic crude material by importers and a reduction in imports of crude barite into the United States were factors affecting the domestic situation. With few exceptions, the consuming industries using crude barite in the manufacture of barium products and chemicals showed gains over 1933. In 1934 a noticeable decline, however, was reported in the sales of barium sulphate (precipitated), which may be partly accounted for by the fewer number of plants manufacturing this chemical in 1934 than in 1933.

ACCORDING to the report of the coal committee of the National Association of Purchasing Agents, stocks of anthracite and bituminous coal in industry in the United States and Canada as of July 1, amounted to nearly 40,000,000 tons—an increase of 5,000,000 tons from the preceding month and an increase of 10,500,000 tons from a year ago.

WESTON, DODSON & CO. INC., through Alan C. Dodson, president, offers a suggestion for building a stronger anthracite industry.

"The anthracite industry is making some progress.

"The Anthracite Institute has lately acquired substantial additions to its membership. The independent operators have formed Independent Anthracite Coals, Inc., patterned after the Appalachian Coals, Inc.

"Charles F. Huber, formerly chairman of the board of directors of the Glen Alden Coal Company, has been selected as administrator for the industry to take charge of a new program to eliminate unfair trade methods, and thus raise the level of competitive practices above those which prevail in so many industries.

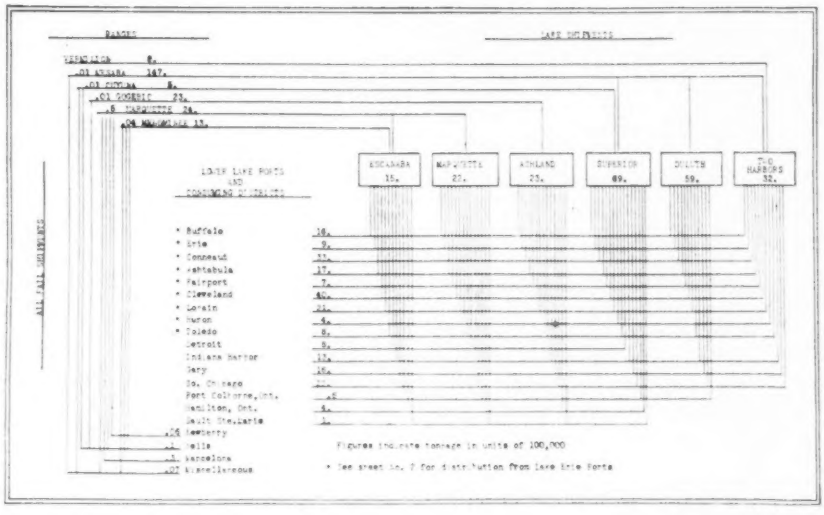
"Approximately 85 percent of the industry has signed up to support the program, which calls for filing prices, terms of sale, and sales policies which have been applied by the producer in connection with all sales. All such information is subject to inspection by producers and purchasers. Thus a policy of open and frank dealings between producers, and between producers and dealers, becomes the order of the day in the anthracite industry.

"We hope it will not be long before the operators see the wisdom of joining cooperatively to give retail coal merchants the support they must have to enable them to sell anthracite in increasing volume in competition with oil, gas, and other substitute fuels. By this we mean a strong cooperative advertising and merchandising campaign to impress people with the fact that anthracite is the most desirable and convenient domestic fuel on the market. Weston, Dodson is heart and soul back of the movement to give retailers every proper support. We would like to see a million-dollar-a-year campaign, which would amount to only two cents a ton on 50,000,000 tons of production.

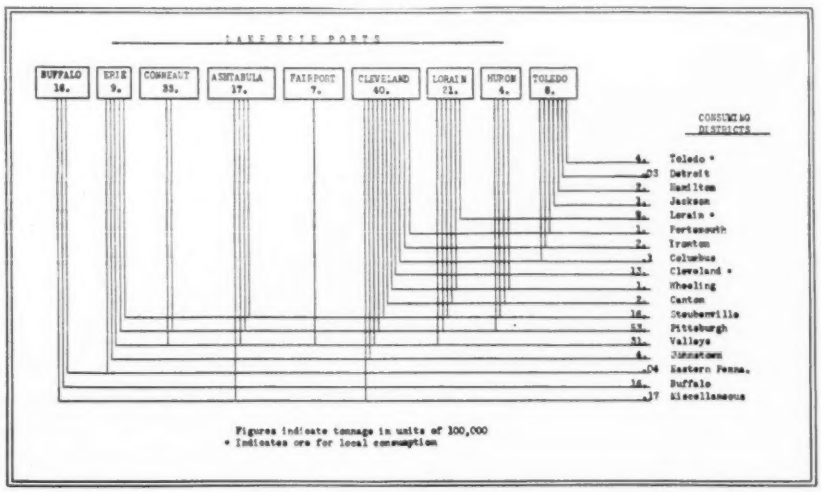
"Filing prices and terms of sale, insofar as it can be done legally, is a good thing; making this information available to producers and retailers alike is eminently fair; classification of coals is desirable and the adoption of a code of fair practices is essential to progress in the industry. But none of these will accomplish much unless we have an increasing demand for our product.

"Certainly nothing will contribute more to bring about this greater demand for anthracite than an improvement in

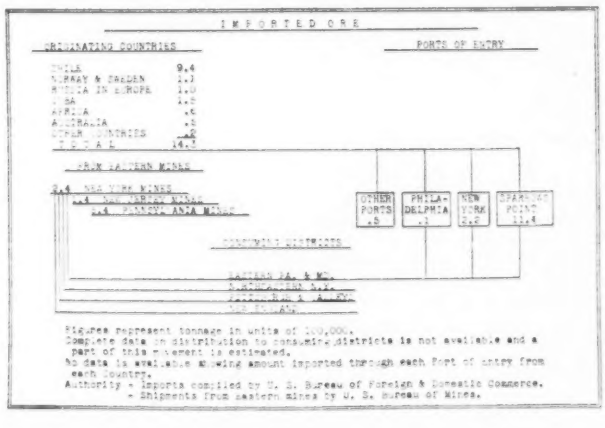
DISTRIBUTION OF LAKE SUPERIOR IRON ORES FROM RANGES THROUGH UPPER LAKE PORTS TO LOWER LAKE PORTS AND DIRECT ALL-RAIL TO CONSUMING DISTRICTS
SEASON 1934



DISTRIBUTION OF IRON ORE FROM LAKE ERIE PORTS TO CONSUMING DISTRICTS
SEASON 1934



DISTRIBUTION OF IMPORTED IRON ORE THROUGH PORTS OF ENTRY AND OF ORE FROM EASTERN MINES, TO CONSUMING DISTRICTS
YEAR 1934


IMPORTED ORE
ORIGINATING COUNTRIES
PORTS OF ENTRY
CHILE 9.4
NORWAY & SWEDEN 1.1
AFRICA IN EUROPE 1.0
ASIA .2
AFRICA .1
AUSTRALIA .1
OTHER COUNTRIES .8
TOTAL 14.7
FROM EASTERN MINES
9.4 NEW YORK MINES
.1 NEW JERSEY MINES
.4 OTHER ASIA MINES
OTHER PORTS .8
PHILADELPHIA .1
NEW YORK 2.2
SPARROWS POINT 11.4
CONSUMING DISTRICTS
Figures represent tonnage in units of 100,000.
Complete data on distribution to consuming districts is not available and a part of this movement is estimated.
No data is available showing amount imported through each Port of entry from each country.
Authority - Imports compiled by U. S. Bureau of Foreign & Domestic Commerce.
- Shipments from eastern mines by U. S. Bureau of Mines.

the morale of those in the entire industry—miners, operators, wholesalers, and retailers. In our opinion, the first effect of such a campaign as we advocate would be upon the industry's morale."

IN THE third report of the Corrosion Committee, published by the Iron and Steel Institute (London, 1935, 214 pages) appears the following section on the corrosion of steel sleepers or ties in coal mines of the Manchester Collieries and the Powell Duffryn Steam Coal Company.

Inspection of Steel Ties

1. In the case of a pit at Tyldesley, steel sleepers inspected at the pit bottom were found to be almost entirely free from any sign of corrosion in the main intake and the main return. This observation was confirmed by the examination of sleepers subsequently removed through the courtesy of the Company after 15 years' service and inspected in daylight by the Committee.

The humidity figures for this pit, which are approximately as given below, probably illustrate the reason for this absence of corrosion:

Place	Dry bulb	Wet bulb	Relative humidity, %
Pit bottom; main return	89	71	39
Pit bottom; intake	56	51	69
1,400 yards in	102	79	34

In effect, it is known from the work of W. H. J. Vernon[1] and others that as soon as the atmospheric humidity rises above a certain critical value, which he places at about 65 percent relative humidity, a marked increase occurs in the rate of corrosion of iron. It is clear that, with the possible exception of the air in the immediate vicinity of the intake at the bottom of the shaft the condition of which presumably varies to some extent with the atmospheric conditions, the humidity is too low to cause any appreciable corrosion. Apart from this, there are other factors tending to eliminate corrosion:

1. The absence of atmospheric pollution, arising from products of combustion.
2. There is, in this pit at least, no running water.
3. In general, the sleepers become covered with a deposit of coal and fireclay dust, which, being dry, will undoubtedly protect them against corrosion.

So far as the deposit of fireclay dust is concerned, it was pointed out by a member of the Committee in the course of the discussion that the practice of stone-dusting, spraying with ground limestone as a protection against firedamp, would also tend to protect the sleepers.

2. The second inspection was made at Ystrad Mynack, where sleepers were inspected at the bottom of a 680-yard shaft. In the upcast, the sleepers were buried in coal dust so that the surface had a blackleaded appearance, and were almost entirely free from corrosion; the relative humidity was 59 percent. In the incast, here 760 yards deep, where the relative humidity was 80 percent, there was evidence of slight rust on the surface of the sleepers, but no appreciable corrosion.

A visit was made to a disused pit at Penarth, which was said to have been very humid and in which the humidity records for the main intake averaged about 94 percent. The original steel sleepers had been brought up to the surface, and two large piles, containing several thousand sleepers[2] were inspected. No sleeper was found that had been perforated by corrosion, although appreciable corrosion had occurred. These sleepers had been in a position for at least seven years.

Metallurgical Examination of Steel Ties

A detailed metallurgical examination of two sleepers removed from the Tyldesley pit and of a corroded sleeper from Penarth was made by a member of the committee. The analyses are shown herewith.

The analyses reveal a wide variation in the materials used a few years ago for the fabrication of steel sleepers of this type. Steel 3 may have been a discard from a rail cast, as micrographs showed that the inclusions in this steel were characteristic of such discards.

Mechanical tests on steel 1 showed the maximum stress to be 29.4 tons per sq. in., with elongation of 19 percent on an 8-in. gauge length, and 40.3 percent reduction in area. The test-piece was very badly laminated (piped).

An analysis of the rust deposit on the corroded sleeper 3 showed that this contained: Fe_2O_3, 71.3; FeO, 5.1; CaO, 1.7; SiO_2, 8.0; Co_2, 6.2; SO_3, 1.7; and Cl, 0.17 percent, together with 4.2 percent of combined water.

Analysis of Steel Sleepers Removed from Coal Mines, Percent

	Tyldesley 1	Tyldesley 2	Penarth 3
Carbon	0.22	0.05	0.50
Manganese	0.56	0.50	0.81
Silicon	0.093	0.035	0.093
Phosphorus	0.037	0.043	0.080
Sulphur	0.048	0.057	0.045
Copper	0.020	0.010	Trace
Nickel	Trace	Trace	Trace

Conclusions

The general conclusion reached by the Committee as a result of their discussions and of these inspections is that the corrosion of steel sleepers should be inappreciable in a dry pit, in a pit with an average relative humidity below, say, 80 percent, and free from water. Under such conditions steel sleepers should have an almost indefinite life.

On the other hand, it is admittedly conceivable that in certain types of mine, where the relative humidity is very high, and particularly where there is running water, either impregnated with sulphur acids or, as is the case in certain pits, with brine, the corrosion of steel sleepers may prove appreciable. It is difficult in the present state of knowledge to make general suggestions for minimizing the corrosion in such cases, since it is probable that each separate case would have to be considered on its own merits, and, moreover, most of the published data on corrosion have been obtained by tests that are not representative of the conditions of use of steel sleepers in mines.

The committee is therefore unable to make any general recommendation as to the protection of steel sleepers in corrosive pits, and consider that a satisfactory answer to the problem could only be obtained by conducting tests under the actual conditions of service. It is possible that alterations in the composition of the steel might be helpful in some cases; for example, the addition of small percentages of copper to steel is known to have a marked effect in reducing its corrosion in stagnant solutions of dilute sulphuric acid, but, on the other hand, tests conducted by the American Society for Testing Materials in running mine water with an acidity of about 0.2 percent,[3] failed to reveal any beneficial effect resulting from the presence of copper. Further, the conditions might be radically different if the water were impregnated with common salt, instead of with sulphur acids.

[1] Transactions of the Faraday Society, 1927, vol. 22, p. 113.

[2] The inspection was naturally limited to the sleepers on the top of the piles, but there is no reason to believe that these were not truly representative.

[3] Report of Sub-Committee V. on Total Immersion Tests of Committee A-5 on Corrosion of Iron and Steel, Proceedings of the American Society for Testing Materials, 1921, vol. 21, p. 157.

Fluorspar

(*Continued from page* 67)

Imports

The imports of fluorspar into the United States in 1934 were 16,705 short tons (10,632 tons containing more than 97 percent and 6,073 tons containing not more than 97 percent calcium fluoride) compared with 10,409 tons (5,165 tons containing more than 97 percent and 5,244 tons containing not more than 97 percent calcium fluoride) in 1933. The imports were equivalent to 19 percent of the total shipments of domestic fluorspar in 1934, compared with 14 percent in 1933.

Of the imports in 1934, about 35 percent was metallurgical-gravel fluorspar, 11 percent ceramic-ground fluorspar, and 54 percent acid (chiefly lump) fluorspar. The metallurgical-gravel fluorspar was imported chiefly from Spain, followed in order by Germany, Newfoundland, United Kingdom, and China; the ceramic-ground fluorspar was imported chiefly from Germany, followed in order by Spain, Italy and China; and the acid-grade fluorspar was imported chiefly from Germany, followed in order by the Union of South Africa, Newfoundland, and Spain.

ACCIDENTS at coal mines in Utah resulted in a larger number of injuries in proportion to the number of man-hours worked by the employes in 1934 than in 1933, according to a study conducted by the United States Bureau of Mines, based upon reports from the mining companies and the State Mine Inspector of Utah. The reports revealed a notable gain in the average quantity of coal mined per man-hour of work performed. While the accident rate per million man-hours increased in 1934 over 1933 and 1932, it remained at materially lower and more favorable level than that which prevailed during 1930 and 1931.

Fewer men worked at the mines in 1934 than in 1933; production of coal and the aggregate number of man-hours worked by all employes during the year also declined. Accidents were not as numerous as in 1933, but the drop in the number of man-hours worked in 1934 caused the accident rate per million man-hours of employment to increase. The chief causes of accidents during 1934 were falls of roof and coal, haulage, handling materials, and machinery. No single accident causing five or more deaths has occurred at a coal mine in Utah since March 8, 1930.

The average employe at coal mines in Utah worked 147 days or 1,067 hours during the year, compared with 177 days or 1,396 hours during 1933, and produced 0.803 ton per man-hour of work, compared with 0.659 ton during the previous year. Forty-three coal mines were in operation during all or part of the year. The mines produced 2,406,183 tons of coal and employed 2,807 men, who worked a total of 2,996,371 man-hours. Accidents resulted in the death of nine men and in the injury of 362, each injury disabling an employe longer than the remainder of the day on which the accident occurred.

DEPICTING the progress of chemical industry and dramatizing the part that the "invisible science" plays in every day life, 21 manufacturing divisions of the E. I. du Pont de Nemours & Co. Inc., will show their products and indicate the processes by which they are produced at the Eastern States Exposition in Springfield, Mass., from September 15 to 21 inclusive.

The exhibit, "The March of Chemistry," will occupy 356 running feet in the Exposition's three-acre Industrial Arts Building and will be the largest single display ever presented at an annual exhibition. It will be of educational nature and will cover a wide range of chemical products, including several spectacular new developments of du Pont research laboratories, showing how they are made, how they are used and how they serve, often in an unseen way, the ultimate consumer.

MINES in Alaska produced minerals worth $16,721,000 in 1934, as against $10,366,000 in 1933, according to an announcement made by the Geological Survey. The total value of the mineral output of the Territory since 1880 is $680,316,000. The following table shows in summary form the mineral output of Alaska for 1934 and, for comparison, the production of the same minerals in 1933:

VALUE OF MINERAL OUTPUT OF ALASKA IN 1934 AND 1933

	1934	1933
Gold	$16,007,000	$9,701,000
Silver	100,000	55,000
Copper	9,700	1,900
Lead	62,100	85,600
Coal	451,500	481,000
Miscellaneous mineral products, including petroleum, platinum metals, tin, etc.	90,700	41,500
	$16,721,000	$10,366,000

Winners of the National Safety Competition of 1934

ANNOUNCEMENT of the winners of the National Safety Competition of 1934, in which recognition was given to outstanding safety records attained during the calendar year 1934 by numerous mines and quarries, was made by John W. Finch, Director, United States Bureau of Mines, which sponsored the contest. Three hundred and thirty-four mines and quarries in 38 states participated in the competition and notable accomplishments were achieved in the operation of mines and quarries without accidents or with quite low accident rates in 1934. The competing companies were divided into five classes: Anthracite mining companies, bituminous-coal mining companies, metal mining companies, operators of nonmetallic mineral mines other than coal mines, and quarries or open-cut mines. A replica of the bronze trophy, "Sentinels of Safety," donated by the *Explosives Engineer* magazine, was awarded to the winning company in each group.

In the anthracite mining group, the winner was the Lawrence mine, in Schuylkill County, Pa., operated by the Harleigh-Brookwood Coal Co. This mine was operated for 727,979 man-hours in 1934 with but 53 lost-time accidents, causing 857 days of disability.

In the bituminous-coal-mine group, the highest award was given to the "C" mine, Superior, Wyo., operated by the Union Pacific Coal Co., which was worked through 225,426 man-hours without a lost-time accident.

Of the metal mines competing, the winner was the East Vulcan mine of the Penn Iron Mining Co., Norway, Mich., which was operated 288,828 man-hours without a lost-time accident.

In the nonmetallic mineral group, first place was given to the LaSalle mine of the Marquette Cement Manufacturing Co., Oglesby, Ill., which was operated through 105,376 man-hours without a lost-time accident.

In the group composed of quarries and open-cut mines, the winner was the Rogers City limestone quarry, Rogers City, Mich., operated by the Michigan Limestone and Chemical Co., which worked 727,503 man-hours in 1934 with no lost-time accidents. This quarry was given the highest award in this group in 1929, 1932, and 1933.

Honorable mention was given, in the anthracite mining group, to the following-named operations: Tomhicken mine, Luzerne County, Pa., operated by the Coxe Brothers and Co., Inc.; Miles Slope mine, Lackawanna County, Pa., of the Hudson Coal Co.; Drifton mine, Luzerne County, Pa., operated by the Coxe Brothers and Co., Inc.; Jeddo No. 4 mine, Luzerne County, Pa., operated by the Jeddo-Highland Coal Co.

In the bituminous-coal-mine group the following-named mines received honorable mention: Ingram Branch mine, Wriston, W. Va., operated by the Elkhorn Piney Coal Mining Co.; Princewick mine, Princewick, W. Va., of the C. C. B. Smokeless Coal Co.; Arno mine, Arno, Va., operated by the Stonega Coke and Coal Co.; Rockhill No. 7 mine, Robertsdale, Pa., of the Rockhill Coal and Iron Co.

Honorable mention was given to the following-named mines in the metal-mining group: Alexandria mine, Hibbing, Minn., of the Republic Steel Corp.; Townsite mine, Ironwood, Mich., of the Republic Steel Corp.; Edwards mine, Edwards, N. Y., of the St. Joseph Lead Co.; Fontana mine, Fontana, N. C., of the North Carolina Exploration Co.; Anvil-Palms-Keweenaw mine, Anvil Location, Mich., of the Youngstown Mines Corp.; James mine, Iron River, Mich., of the James Mining Co.

Among the nonmetallic mines the following were honorably mentioned: Akron mine, Akron, N. Y., operated by the Certain-teed Products Corp.; Wampum mine, Wampum, Pa., of the Crescent Portland Cement Co.; Clarence Centre mine, Clarence Centre, N. Y., of the National Gypsum Co.; Independence mine, Independence, Mo., of the Missouri Portland Cement Co.; Akron mine, Akron, N. Y., of the Universal Gypsum and Lime Co.; Lower Gypsum mine, Gypsum, Ohio, of the United States Gypsum Co.

In the group comprised of quarries and open-cut mines, the following-named operations were given honorable mention. All of these mines or quarries operated without a lost-time accident in 1934:

Billmeyer quarry, Bainbridge, Pa.,

operated by the J. E. Baker Co.; Inland limestone quarry, Manistique, Schoolcraft and Mackinac Counties, Mich., of the Inland Lime and Stone Co.; Fort Smith sandstone quarry, Fort Smith, Ark., operated by the Sebastian County Rock Crusher; Mary Lee phosphate rock mine, Mulberry, Fla., of the Coronet Phosphate Co.; Mahoning iron ore mine, Hibbing, Minn., of the Mahoning Ore and Steel Co.; Dunwoody mine, Chisholm, Minn., of the Orwell Iron Co.

Krause No. 1 quarry, Columbia, Ill., of the Columbia Quarry Co.; LaSalle quarry, Oglesby, Ill., of the Marquette Cement Mfg. Co.; Scranton mine, Hibbing, Minn., of the Hoyt Mining Co.; Cape Girardeau No. 2 quarry, Cape Girardeau, Mo., of the Marquette Cement Mfg. Co.; Reformatory quarry, Anamost, Iowa, operated by Iowa State Reformatory; Naginey quarry, Naginey, Pa., of the Bethlehem Steel Co.; Buckeye Creek quarry, East Fultonham, Ohio, of the Pittsburgh Plate Glass Co.; Ruegg quarry, Ruegg, Mo., of the Missouri Portland Cement Co.; Winchester quarry, Winchester, Mass., of the General Crushed Stone Co.; Pen Argyl quarry, Pen Argyl, Pa., of the Bangor Fidelity Slate Co.; Ormrod quarry, Ormrod, Pa., of the Lehigh Portland Cement Co.

Union quarry, Mount Wolf, Pa., of J. E. Baker Co.; Sagamore mine, Riverton, Minn., of the Sagamore Mining Co.; Leroy quarry, Leroy, N. Y., of the General Crushed Stone Co.; Akron quarry, Akron, N. Y., of the General Crushed Stone Co.; Biwabik mine, Biwabik, Minn., of the Biwabik Mining Co.; Kinney mine, Kinney, Minn., of the Republic Steel Corp.; Woodville quarry, Woodville, Ohio, of the Woodville Lime Products Co.; Glenford quarry, Glenford, Ohio, of the Central Silica Co.; Cowell quarry, Cowell, Calif., of the Cowell Portland Cement Co.; Fordwick quarry, Fordwick, Va., of the Lehigh Portland Cement Co.; Berkeley Nos. 5 and 6 quarry, Martinsburg, W. Va., of the North American Cement Corp.

York mine, Nashwauk, Minn., of the York Iron Mining Co.; Union Bridge quarry, Union Bridge, Md., of the Lehigh Portland Cement Co.; Fogelsville quarry, Fogelsville, Pa., of the Lehigh Portland Cement Co.; Plainville No. 4 quarry, Plainville, Conn., of Connecticut Quarries Co., Inc.; Glens Falls quarry, Glens Falls, N. Y., of the Glens Falls Portland Cement Co.; Auburn quarry, Auburn, N. Y., of the General Crushed Stone Co.; Brooksville quarry, Brooksville, Fla., of the Florida Portland Cement Co.; Martins Creek No. 4 quarry, Martins Creek, Pa., of the Alpha Portland Cement Co.; Plymouth mine, Wakefield, Mich., of the Plymouth Mining Co.; Middlefield No. 1 quarry, Middlefield, Conn., of the Connecticut Quarries Co., Inc.; Volunteer mine, Palmer, Mich., of the Palmer Mining Co.; Mitchell quarry (Lehigh Lime Co.), Mitchell, Ind., of the Lehigh Portland Cement Co.

Nazareth quarry, Nazareth, Pa., of the Lone Star Cement Co.; Birmingham quarry, Birmingham, Ala., of the Lehigh Portland Cement Co.; Bennett mine, Keewatin, Minn., of the Bennett Mining Co.; Lone Star quarry, Greenport, N. Y., of the Lone Star Cement Co. of N. Y., Inc.; Union Furnace quarry, Tryone, Pa., of the American Lime and Stone Co.; Watertown quarry, Watertown, N. Y., of the General Crushed Stone Co.; Petoskey quarry, Petoskey, Mich., of the Petoskey Portland Cement Co.; New Castle quarry, New Castle, Pa., of the Lehigh Portland Cement Co.; Culbert quarry, Marion, Va., of W. F. Culbert & Sons.

Catskill quarry, Catskill, N. Y., of the North American Cement Corp.; Rockdale quarry, Williamson, Pa., of J. E. Baker Co.; Clinchfield limestone quarry, Clinchfield, Ga., of the Pennsylvania-Dixie Cement Corp.; Corsica mine, Elcor, Minn., of the Corsica Iron Co.; Steelton quarry, Steelton, Pa., of the Bethlehem Steel Co.; Thomaston limestone quarry, Thomaston, Me., of the Lawrence Portland Cement Co.; El Paso quarry, El Paso, Tex., of the Southwestern Portland Cement Co.

Dallas quarry, Dallas, Tex., of the Lone Star Portland Cement Co., Texas; West Conshohocken quarry, West Conshohocken, Pa., of the Valley Forge Cement Co.; Dewey quarry, Dewey, Okla., of the Dewey Portland Cement Co.; Catskill quarry, Catskill, N. Y., of the Alpha Portland Cement Co.; Stockertown quarry, Stockertown, Pa., of the Hercules Cement Corp.

AX THE HEALTHY

—Washington Post

Advancement in Vibrating Screens

VIBRATING screens were practically unheard of some 17 or 18 years ago, and the rapid strides that have been made in the design and construction of such machines speaks well of the efforts of those who have specialized in this field of endeavor.

The earliest types employed either electrical or mechanical vibratory actions, with the most widely used vibratory frequency ranging from 1,600 to 1,800 revolutions or vibrations per minute. This speed, with the proper amplitude and form of action has proven to work out the best in that bracket of screening where screen cloth openings will range from 2-in. clear openings on down to as fine as 100-mesh, and especially from 1-in. on down to 50-mesh. In recent years the mechanical off-center weight types, of which there are quite a number on the market, apparently leads in popularity and has become the most widely used type for fine screening service on all mineral aggregates.

A mechanical vibrating screen, which might better be called a high-speed shaking screen, as it operates on that principle although with shorter throw, and speeds in proportion to throw ranging from 600 to 1,200 revolutions per minute, has come into considerable use during late years in replacing rotary or shaker screens on the very coarse separations. While their violent action is detrimental when handling coal, where breakage must be kept to a minimum, they serve well in handling coarse aggregates on screen sections with openings at or above 2 inches.

Each of the types mentioned above will serve best when properly applied. There are so many factors governing the choice of the proper screening equipment for each particular installation, that it is always best to obtain the recommendations of the reliable manufacturers of vibrating screens, to be sure that the correct type is chosen for your work.

THE report of the Anthracite Institute Laboratory Technical Sub-Committee on Anthracite and By-Product Coke, is a comprehensive 21-page treatise covering the two fuels. It discusses analyses, moisture content, heat value, density, ash content, attention, flue dust, efficiency, corrosion, combustion, banking, acceleration and clinkers. The report also includes a condensed summary listing 37 outstanding points of superiority for anthracite.

This report is the second of a series which is planned as a reference work on the use of anthracite.

BITUMINOUS coal production in the United States for the week ended August 10 is approximately 4,975,000 net tons. Production for the corresponding week: 1934, 5,772,000 tons; 1933, 7,478,000 tons. The report of the Bureau of Mines shows production of 6,283,000 tons for the week ended July 27, and 5,335,000 for the week ended August 3, 1935. Production calendar year to August 10: 1935, 218,662,000 tons (subject to revision); 1934, 216,398,000.

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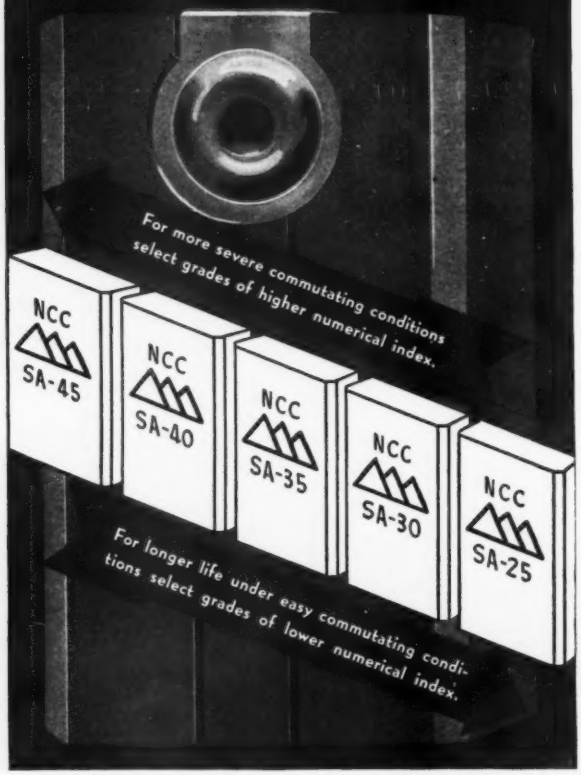
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NEWS OF MANUFACTURERS

THE Chicago branch offices and warehouse of the Macwhyte Company were moved on July 1 from 507 Clinton Street to the newly remodeled Macwhyte Building at 228 South Des Plaines Street. At this new location stocks of Macwhyte wire rope, including Monarch Whyte Strand, Special Traction Elevator Cable and Hi-Lastic Spudder Lines will be maintained for immediate delivery in the Chicago area. The new telephone number is Monroe 5584.

FOLLOWING reports of satisfactory performance of the several machines built and placed in service, the Link-Belt Dewatering Rotoscoop is now announced by Link-Belt Company, Chicago and Philadelphia, as a perfected device for recovering fine or coarse sand and similar material. The new machine fills the need for a sand dewatering device capable of recovering the available sand grains, of sufficient fineness to meet specifications, and discharging the product dry enough to permit truck transportation, or mechanical conveying to and from storage. It is suitable also for treating other materials besides sand, and provides a simple method of saving special grain sizes which were formerly lost in the overflow water.

The Rotoscoop is a self-contained machine consisting essentially of a large circular steel tank or container into which the water and the materials to be treated are introduced; a slow-moving power-driven suspended rotating disc to the underside of which are attached inclined adjustable renewable scoops for moving the material within the tank; a curved steel adjustable renewable plow mounted in a stationary position above the rotating disc, for plowing off and discharging the dewatered product ready for use; and the necessary driving machinery mounted above the tank on the same steel supports from which the rotating disc is suspended. The machine is made in four sizes; 15 ft., 12 ft., 9 ft., and 6 ft. diameters, with capacities ranging from 20 to 150 tons an hour, based on material weighing 100 lbs. per cu. ft.

THE AJAX FLEXIBLE COUPLING COMPANY, Westfield, N. Y., announces a helical gear reduction unit called the Lectrigear to be made in sizes ranging from ⅛ to 2 hp.

Standard footless motors are used without any changes in shaft or bearings. Lectrigears can be furnished either with or without motors.

Two characteristics differentiate the Lectrigear from previous designs.

1. It is unnecessary to use a specific make of motor, there being several standard makes that can be used without change.

2. Lectrigears can be furnished without motors which permits the user to provide his own motors and do his own assembly work—a simple operation taking but a few minutes.

DIRECTORS of Blaw-Knox Company, at their organization meeting created the office of chairman of the board. Albert C. Lehman, president, was elected to the new post in appreciation of his 30 years of service to the company since its inception, a resolution of the board stated.

Irvin F. Lehman, vice president, who has also been associated with the company since its early days, was elected president, and Frank Cordes was made senior vice president.

The following were reelected: Chester H. Lehman, vice president; Robert F. McCloskey, vice president; George L. Dumbauld, treasurer; H. B. Loxterman, secretary; B. L. Hirshfield, chairman, finance committee; Paul W. Keim, assistant treasurer; H. S. Strassburger, assistant treasurer and assistant secretary; P. A. McCullough, comptroller.

SALES billed by General Electric Company for the first quarter of 1935 amounted to $40,393,538, compared with $34,935,551 for the same quarter a year ago, an increase of 16 percent, President Gerard Swope announced to stockholders of the company at their annual meeting.

Profit available for dividends on the common stock amounted to $5,390,930 for the first quarter of 1935, compared with $3,921,961 for the first quarter of 1934, an increase of 37 percent. This is equivalent to 19 cents a share for the 1935 quarter and 14 cents a share for the 1934 quarter. Mr. Swope pointed out that last year a dividend of 15 cents a share was paid on the special stock out of the earnings of the first quarter, while for the first quarter this year there is no such deduction from earnings, as the final payment made upon retirement of the special stock on April 15 was provided for last year. This is equivalent to approximately 2 cents per share for the quarter on the common stock.

THE International Acetylene Association will hold its thirty-sixth annual convention this year in Cleveland, at the Cleveland Hotel, on November 12, 13, 14, and 15, according to an announcement just issued by the association's secretary, Mr. H. F. Reinhard.

FOR a number of years, geophysical prospecting has played an important part, in this country, in locating and defining oil deposits. To describe geophysical prospecting very briefly, it may be said that this operation entails (1) the creation of earth vibrations by means of the detonation of high explosives, usually loaded in relatively deep, water-filled holes, and (2) the recording of the time of travel and character of these vibrations by suitable instruments located at varying distances from the shot point. To satisfy the highly specific requirements of this type of work, special explosives and electric blasting caps have been developed.

The most economical explosive for geophysical prospecting has proved to be a 60 percent ammonia gelatin. This type, which contains a relatively high amount of ammonium nitrate, is very water-resistant and has desirable strength and velocity characteristics. Three different gradations of 60 percent ammonia gelatin have been developed by the du Pont Company for seismograph work: Seismogel A, Seismogel B, and 60 percent special gelatin. Seismogel A is a very hard, hand-packed gelatin dynamite for use under unusually severe loading conditions. Seismogel B is a firm gelatin well suited to the usual type of seismograph work, while the 60 percent special gelatin is a very plastic and cohesive grade designed for operations which demand a product of this type.

The several powders just discussed fulfill the normal geophysical requirements. Occasionally, however, shots are made in very deep, water-filled holes, 200 ft. or more in depth. For such severe use, there is available an explosive known as 60 percent hi-velocity gelatin, which has the ability to detonate at full strength under water pressures which would affect adversely the usual gelatin dynamites.

The four types of gelatins just described possess almost identical explosive properties in speed and strength. These powders are packed in the different sizes and weights desired by the seismograph trade.

In the usual types of work requiring electric blasting caps, a detonator serves only one purpose, that of initiating the explosive charge in which it is embedded. On this basis, the cap is not required to satisfy any precise limitations as to speed or uniformity of detonation. In establishing the time vs. distance values desired in seismograph exploration work, however, the exact instant of the dynamite explosion must be known, and the speed and uniformity of detonation of the electric blasting cap play an important part in the accuracy of this measurement. For this reason, a comprehensive laboratory program has been carried on for the purpose of determining the speed characteristics of various detonating compounds. In these experiments, the cathode-ray oscillograph has been used, since this instrument is particularly well suited to the measurement of small intervals of time.

This laboratory study has resulted in the progressive improvement of the seismograph electric blasting cap, and very recently a new detonator has been placed on the market. This product, known as the "SSS" type, possesses qualifications far in excess of those now needed in exploration work and should prove of exceptional value to the seismograph trade.

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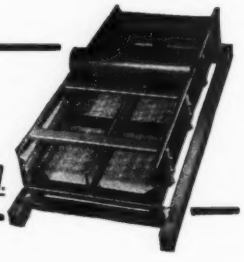

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At Chicago—September 23-27, 1935

the leaders of these great industries will congregate to discuss their mutual problems, to agree upon a program of cooperative action in behalf of all.

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See the Program for this meeting in this issue

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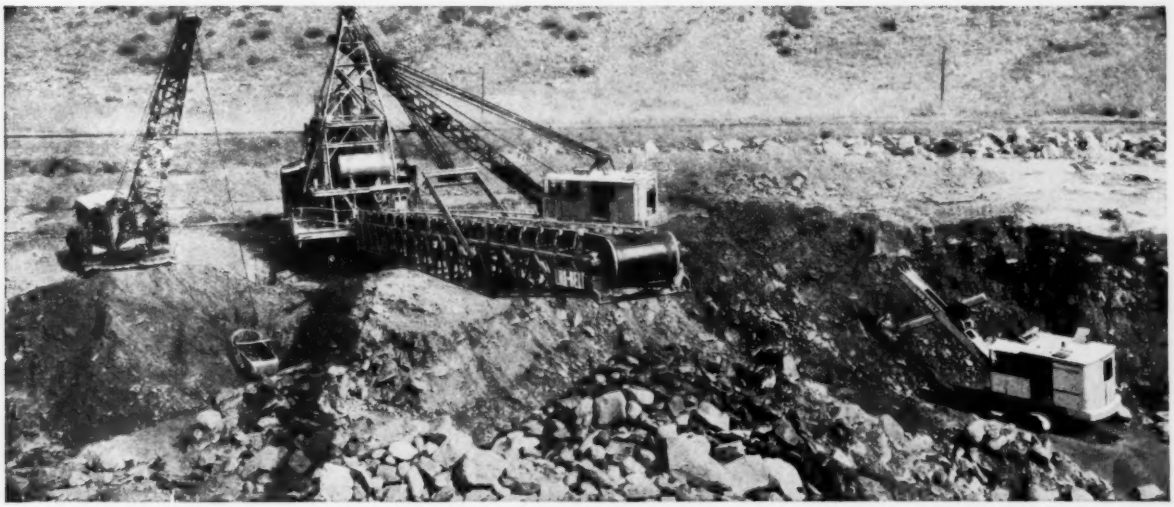

SOUND engineering and the correct application of the right equipment to fit the conditions, are reasons for the success of this placer gold recovery operation undertaken by Humphreys Gold Corporation, of Denver. The location is on Clear Creek, near Denver, the scene of much of Colorado's gold mining activity since 1858.

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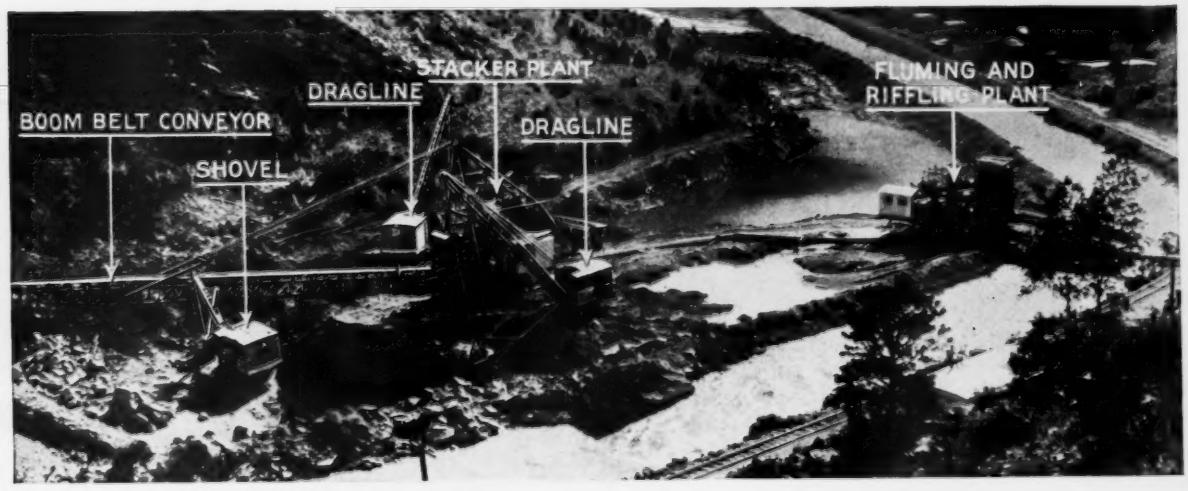

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